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The Engineering and Mining Journal

JANUARY 21, 1911.

The Transvaal Stope Drill Competition

The official report of the committee in charge of the Transvaal stope-drill competition has just come to hand and its leading features are abstracted on page 163 of this issue. The four drills remaining in the competition to its close all completed the contest with noteworthy and enviable records; indeed, so close was the result that the judges decided to divide the first and second prizes between the Holman 2⅛-in. and the Siskol drill, the latter having a greater footage to its credit, while the Holman drill had a slightly better cost per foot, 9.77d. as against 9.9d. per ft. attained by the Siskol.

It developed fairly early in the competition that many of the drills were of too light construction and that the hammer drills as at present developed were not suited to the local conditions, none of that type completing the contest. One of the salient points brought out by the competition is the general conclusion that the weight limit set was too light and that a drill weighing 125 or 130 lb. would be as practicable to handle in the stopes and more economical in operating cost than the 100-lb. drill required by the provisions of the competition.

Generally speaking, drills of new design were not successful, but a number of the machines that did not complete the contest showed particular points of merit which will doubtless be incorporated in future drills to be used on that field and elsewhere. Two drills of South African design, the Konomax and the Chersen, made an excellent record in many respects. The air economy of the former was particularly praiseworthy, but details of construction had not been worked out sufficiently for so vigorous a contest, where no changes were permissible after the beginning of the competition. Strengthening the construction of the machines with a small increase in weight would have reduced maintenance cost without increasing the expense for labor, as five "boys" were required for two of the 100-lb. machines. The report contains many interesting data regarding cost of steel, air consumption at various pressures, etc., and can be studied with profit. While conditions were not always ideal, it is evident that the committee took great precaution to have the competition conducted with fairness and the contest has proved of much value to Rand operators.

The Oil Resources of California

The wonderfully productive oilfields of Southern California, a State heretofore preëminent for its gold mines, naturally attracted the attention, at an early date, of the able and enterprising group of mining engineers who made their headquarters in San Francisco. Many of these men have become prominently identified with the development of this new resource, as have also to a less extent engineers of other parts of the United States. Heretofore the petroleum industry has been in the hands of a guild of venturesome men originating in Pennsylvania, where the early experience was gained. From there they moved to the Lima field, and thence to Kansas, pushing down into Oklahoma; and to Louisiana and Texas. With a scent amounting almost to an instinct, they gathered quietly wherever petroleum indications were discovered, and unostentatiously brought in their drilling rigs and were producing oil almost before the local inhabitants knew it had been struck. The wildcatters seeking to find new pools were ever in the vanguard, and right after them the speculators seeking to obtain leases at nominal figures from the unsuspecting farmers. The business was exciting and made many fortunes, but under its conditions the engineering aspects did not receive the maximum of attention. Certainly our technical literature was not much enriched.

This was bound to be different in the case of the California fields, partly because of the higher cost of development involved there, and partly because of the interest of a different class of men, as mentioned above. Already their contributions to technical literature are beginning to appear. Thus we had the pleasure of publishing in our issue of Jan. 7 an illuminating review by Mr. Requa, and more recently has appeared a pamphlet by him, comprising an address delivered before the Mining Association of the University of California. This is a comprehensive presentation of the commercial and engineering aspects of California petroleum.

Mr. Requa is of the opinion that California will probably maintain its present annual production for at least 50 years, and during that period it will be the dominating factor in the fuel situation of the Pacific Coast. Even Alaska coal can scarcely compete with it right at home. The actual cost of producing oil in California is estimated at 30@35c. per bbl., including redemption of capital, etc. The engineering consideration is manifested by Mr. Requa when he calls attention to the facts that oil production, like metal mining, depletes reserves with no hope of replenishment; and that apparent profit is not real profit. Also he riddles the claims of the fakers who have represented the industry as being "the long-sought, sure way of getting rich quick."

California petroleum is undoubtedly destined to be not only an important factor in the development of the Pacific Coast, but also of the country far into the interior. Already it is being used extensively by the railways, and as a metallurgic fuel at several important smelting works. It is even to be carried so far as to Ely, Nev. On the coast itself it will command the markets wherever ships may be able to carry it.

The Advance in Coal Mining

The first of several articles describing the Marianna mine of the Pittsburg-Buffalo company, is published in this issue of the JOURNAL, and forcibly reminds us that both the equipment and the methods employed in mining coal in America, have undergone radical changes for the better in recent years.

Less than a decade ago, the methods employed in bituminous mining were crude in the extreme. Entries were often driven water-level, and rooms were generally turned and worked without definite centers. The result was a loss of millions of tons of coal through creeps and squeezes, and an extraction of sometimes less than 50 per cent. No one bothered much about removing or dampening dust, and furnace ventilation was common in many parts of the country. Safety lamps were used by the fire-bosses in their daily examinations, but few, if any, bituminous mines had abolished naked lights entirely.

Conditions today are entirely changed. The problems of gas and dust are better understood, and remedies applied in a majority of our mines. Underground development is carried on systematically, and 90 per cent. extraction is not unusual. Safer explosives are being employed, and that without any material increase in the percentage of fine coal. Trained men with rescue appliances are available in practically every district, and experienced engineers employed by the Bureau of Mines are in constant readiness to lend aid and advice to any afflicted company.

Anthracite mining was better conducted 10 years ago than was the bituminous industry, and as a consequence the advances in hard-coal mining have not been proportionately great. The anthracite field has been the birthplace of most of our innovations; especially is this true of the first-aid work. But the leadership of the anthracite companies was due entirely to their greater strength through consolidation. As is shown at Marianna, the bituminous industry has now come into its own, and whether on the surface or underground, the hard-coal companies must look to their laurels.

In building the Marianna plant, John H. Jones, president of the operating company, proposed to show that a coal mine could be constructed according to advanced ideas (although they differ radically from present practice), and still be a successful operation from the viewpoint of economy. Mr. Jones, literally speaking, was raised in the mines and it is this intimate contact with, and knowledge of, conditions underground that inspired him with the desire to have the safest and most modern mine in America.

It is with pleasure that we are able to present this remarkable series of articles about the materialization of his ideas.

The government of West Australia has been carrying out investigations on a large scale on the effect of dust on the health of miners in that state. Doctor Crumpston examined about 7805 miners. He states that the expectation of life of the average miner is 3½ years less than the average of other occupations. He found fibrosis of the lungs caused by dust, or "silicosis" in its early stages among 33 per cent. of rock-drill operators, 3 per cent. of truckers and 24 per cent. of men employed in the dry-crushing plants of Kalkoorlie. The last stages are found only among rock drillers.

The Bogoslovsk Mining Company, which had resigned its membership to the "Medj" syndicate, to take effect Jan. 1, 1911, has resolved to continue its agreement with the syndicate for six more years, on account of concessions made by the "Medj." This means for the "Medj," the monopolization of the Russian copper market. The Kyshtym company, having also joined the syndicate, the percentage of outsiders representing the Russian copper industry has been reduced to about 5 per cent.

It is said that since the American Telephone Company took hold of Western Union there has been a very drastic elimination of bucket-shop-wire business. It is understood that today Western Union has but three or four bucket-shop wires in operation and these are west of Chicago. The American Telephone Company cut off this business at one stroke because it felt that a policy of enlightened self-interest demanded it.

In the *Saturday Evening Post* Thomas A. Edison is quoted as making some statements as to possibilities of gold extraction from low-grade materials. The article says: "No mines are being worked at present wherein there is less than $3 to the ton. Great clay beds in a certain section of the country run about $1. It is probable that a process of extracting gold from these clays will be developed within a reasonably short time. Mr. Edison says that under Philadelphia there is a stretch of clay 40 miles long which assays 30c. per ton." We should really be alarmed if the thought did not occur to us that Mr. Edison's adventures in mining and metallurgy have not been so successful as his inventions in the domain of electricity.

Correspondence and Discussion

Contract Drilling versus Company Drilling

In any mining district, either new or old, but particularly in the former, there is always to be found a great number of exploration companies. For the most part, these companies are organized with a comparatively small working capital. At the present time, perhaps one of the most notable fields of this sort is that part of northern Minnesota covered by the three iron ranges, the Vermillion, the Mesabi and Cuyuna.

As soon as a company of this sort is organized and ready to operate, and since the greater portion of the exploratory work on these ranges is done by means of drilling, the question immediately presents itself, "Shall the drilling be done by contract or shall the company purchase its own drilling outfit and do the work itself?" It is this question, as it affects a small, comparatively unknown company, that will be considered.

Drilling by Contract

There are a number of factors in favor of letting the work by contract, or, of course, there would be no business for the drill contractors. If the work is done by contract, and in this discussion I am considering only a drilling company of recognized standing, the exploration company immediately relieves itself of considerable responsibility and annoyance. It is merely necessary to employ some competent person, preferably an engineer, to supervise the work and protect the company's interests. The exploration company pays for the work at a stipulated rate per foot. This may be either a flat rate or a variable rate depending upon the nature of the material through which the drill passes. In either event it includes both churn-drill work and diamond-drill work. Therefore, the company at once relieves itself of all trouble in connection with the use of diamonds, and these are manifold.

By this arrangement, it is possible to know beforehand about what the work is going to cost. The company can be assured that the greatest possible speed will result, as this is an important factor in profitable contract work. Also drilling can be stopped for a reasonable length of time without incurring expense, as the cost is based on footage. This cost per foot includes all necessary moving from hole to hole, the hauling of supplies, and the cutting of roads. All of this work is expensive and requires close supervision. In contract work the exploration company has none of this to worry about. It is often desired that the assays of samples and the reports of results be absolutely

Views, Suggestions and Experiences of Readers

above question. If the work has been done by a reliable and long-established drilling company, the exploration company as a rule, is assured of reliable reports. The principal factor, of course, which argues against this method of doing the work, is the high cost per foot. This side of the argument can be summed up in the statement that, for possibly a maximum figure, the exploration company is getting reliable results with the minimum amount of labor, worry and trouble to itself.

In favor of the company doing its own work, there are several arguments which are worthy of consideration. The work can be stopped and started as desired, and there will be no trouble with the contractors. A hole may be pulled regardless of depth attained, and a long move made without any fear of causing difficulty, as it surely would if the work was being done by contract and only a shallow depth had been attained. But the most important consideration in favor of this method is the possibility of reducing the cost per foot.

Cost of Drilling Equipment

The argument against the exploration company doing its own drilling will bear careful consideration. The first one that will present itself is that of initial cost. If the drilling outfit is rented, the payment is distributed over a number of days or months instead of being made at once. If, however, as is usually done, a new outfit is purchased outright there is quite a large initial outlay. A complete churn-drilling outfit, with all the necessary bits, casing, etc., will cost about $1500. This cost can be easily increased by the greater amount of casing required for very deep holes. It is useless to attempt to do good work without a diamond drill also. Five or six hundred dollars more can be added for this, and then comes the question of diamond bits. Two bits at least are necessary in order to continue work while a worn bit is being reset. The diamonds for two bits will cost at least $2000; altogether it means an investment of approximately $4000. To properly operate the drill, three men are required, and a fourth man, a diamond setter, is necessary to keep the bits in order. The labor cost for one day, therefore, will figure up to at least $12.

Whenever the drill is idle, the labor cost continues as usual, and in addition there is $4000 that is earning nothing. It is quite evident that, other things being equal, the greater the footage made, the less will be the cost per foot. In order, then, to operate economically and to keep the cost per foot at a minimum, the drill must be kept continually at work. To secure this, close supervision is necessary, to see that no time is wasted in making moves or repairs. To make moves without waste of time, it should be known in ample time beforehand, just where the next hole is to be drilled, and therefore ample territory for drilling should be available. Granted all this, the old question will then be brought up. "Who will accept our reports as they stand?" Experience alone will answer this.

This side of the argument, then, can be summed up in the statement that for possibly a minimum expenditure of money, the company is getting results which will undoubtedly be questioned by others, and with the maximum amount of worry and trouble to itself. It would seem, therefore, that the whole thing resolves itself into the questions: (1) How much drilling is to be done? (2) How large an acreage is available for drilling? (3) What sort of an organization does the company wish to maintain? Barring extraordinary conditions, the decision as to whether the work should be done by contract or by the company, should be based upon the answers to these questions, as considered above.

L. E. Ives.

Minneapolis, Minn., Jan. 3, 1911.

Soldering Aluminum

In the Journal, Dec. 10, 1910, it is stated in answer to a correspondent that "the best aluminum solder is composed of lead and zinc in various proportions." Is that information reliable? I have studied the question 20 years, and I never knew of anyone getting good results with those alloys.

My father's solder has been sold steadily for 15 years (here and abroad), and was awarded a medal by the Franklin Institute. Speaking frankly, I know of no other solder which has given like satisfaction. It is sold by Janney, Steinmetz & Co., Philadelphia, and its composition given in my book on aluminum.

Joseph W. Richards.

South Bethlehem, Penn., Dec. 22, 1910.

[The solder referred to by Doctor Richards was described in the original patent specifications as 78.34 per cent. Sn; 19.04, Zn; 2.38, Al; 0.24, P, the last element being a powerful deoxidizer. In

later practice the solder was made by melting together 1 part phosphor tin, 11 parts zinc, and 29 parts tin, which corresponds, according to Richards' "Aluminium," to 71.2 per cent. tin.—ED.]

The French Experiments on Coal Dust

M. Taffanel, commenting on his experiments at the Lievin testing galleries in his report, as briefed by Henry Briggs and quoted in the JOURNAL of Dec. 24, 1910, suggests that the "well established fact that explosions more frequently traverse the intakes than the returns," cannot be due to the fact that the opposing velocity of the intake air would provide more oxygen for the combustion of the exploding units, such velocity being negligible in comparison with that of the exploding and exploded gases. To quote: "When an explosion of dust is witnessed in the test gallery under favorable conditions, using fine pure dust, rich in volatile constituents, it becomes evident that the blasts of air rising immediately on the ignition of the dust, and which not only acompany, but precede the flame have a velocity so vastly superior to that of a normal current of air traversing a mine roadway that the original direction of the latter must be a matter of indifference."

It is certain that this conclusion would be in a measure true, if it were not that, whenever a body is suddenly stopped, the momentum creates an immense force often out of all proportion to the force which, acting persistently, has set it in motion.

The product of the propelling or retarding force and the time of said propulsion or retardation (frictional resistance and thermogenic losses not being here considered) equals the product of the mass propelled, multiplied by the velocity of propulsion or the loss of velocity in the case of retardation.

Algebraically, $ft = mv$

If the time be infinitely short $t = o$ and f becomes infinite since mv is a finite quantity.

Now it is certain that when an explosion is taking place, the time between normal ventilation and its reversal by the force of the explosion approaches zero. Of course not all the air comes to rest in an "inappreciable" time, as the air to the rearward of the column "closes up slowly" with less and less pressure resulting from the arrest of motion as the portion of the column we are considering is remote from the initial halting place. But the increase of pressure must be considerable where the explosion has taken place and may well create such a condensation of the fire-sustaining medium that the fire is more freely propagated there than on the other side of the explosion where there is rather a tendency to a vacuum as far as the action of the fan or other ventilating factor is concerned. It would seem that this compressing, condensing action (practically made use of in the hydraulic ram for raising water above its level by its own velocity, the cause of many breakages and leakages in water lines, an obvious action exhibiting itself whenever a door is closed however slowly in the mines) is so plain and important as to be readily comprehended and its value appreciated.

EFFECT OF ARRESTING MOTION OF INTAKE AIR

And again, when a body is carried by a fluid medium (gaseous or liquid) and the motion of that medium is suddenly arrested, the motion of the supported body continues after the motion of the medium has ceased, or discontinues before it ceases, respectively, according as the supported body is heavier or lighter than the medium upholding it. The body has the velocity of the fluid medium which has been slowly communicated to it, but by virtue of its density it has its own momentum per unit of volume and when the momentum of the fluid medium has been dissipated, that of the body it has carried may be yet in part existent if that body, bulk for bulk, is heavier than the medium in which it is immersed. Hence the arrest of motion of the inflowing air tends to aggregate the dusts more than it condenses the air and to push them forward to the end of the column somewhat as goods are shot forward out of a suddenly stalled cart. Thus the dusts are carried forward to the seat of the explosion and there exploded. It is a matter for test how far this is a ponderable consideration.

Other possible causes are:

(1) Return airways are smaller and therefore less equal to the conduction of an explosion.

(2) Return airways may contain enough occluded blackdamp to deaden an explosion.

(3) Dust in return airways may have less occluded firedamp and the solid hydrocarbons may be broken down into a less inflammable compound.

(4) The air is less pure in the return airways and furnishes less oxygen.

Most of these causes M. Taffanel has instanced. But, on the whole, the explosion usually has to decide, if one may so express it, between traveling right or left on an airway where these four conditions are at first alike. Bursting from a heading or a room into an airway at right angles with a uniform cross-section, uniform chemical condition of surrounding walls, uniform and equal dustiness, uniform ventilation of air of equal oxygenation and humidity, why does the explosion usually follow back on the intake instead of following the air current in the returns? Clearly none of the four reasons just given can apply at any rate, to the first overwhelming blast, though it may have some bearing on later developments.

And if the direction and velocity of the current is the cause of the preference of the explosion for intake airways, the velocity of the current may be assumed to be an important factor in an explosion and then the objection to hurricane ventilation receives a new significance. It not only dries and raises the dust, but it creates the compression and aggregates the dust in the fire zone, in case of an incipient explosion.

It might be well to test in a gallery the disposition of deposited dust when a suddenly interposed diaphragm cuts off a rapid current of air, which is heavily laden with pulverized coal.

R. DAWSON N. HALL.

Du Bois, Penn., Dec. 27, 1910.

Best Material for Stamp Mill Parts

The article by A. Z. Randall, appearing in the JOURNAL of Dec. 10, 1910, was of particular interest to me. No doubt a discussion or exchange of ideas on the subject of "Best Material for Stamp Mill Parts" through the columns of your paper, would bring out facts and figures of value and universal interest to stamp-mill managements in the mining field throughout the country. The method of reporting costs per ton of ore crushed now seems to be the accepted practice, and in many years' travel among the mining camps I have endeavored to get at these costs, doubtless, in many cases to the annoyance to the battery man, but have obtained data from different parts of the country pertaining to per-ton-of-ore-crushed costs that raise the mental query as to the why and wherefore of the wide difference of figures gathered. Some managements seem disinclined to make statements of costs, but it is worthy of notice that these conditions are giving way to the demand of stockholders for detailed facts and figures. I trust you will receive many communications on this subject and would gladly submit results of my inquiries along this line.

GEORGE W. MYERS

San Francisco, Cal., Dec. 24, 1910.

The Parcels Post

Why does not the JOURNAL put its large influence back of the parcels-post legislation? Every miner and prospector in the West wants it. Those of us who have enjoyed the benefit of the Mexican parcels post (*bultos correos*) think Uncle Sam is pretty slow in postal matters.

BUSCONE.

El Paso, Texas, Dec. 29, 1910.

? QUESTIONS and ANSWERS ●

Separation of Barite and Chalcopyrite

I have an ore containing barite and chalcopyrite in approximately equal proportions. How can these minerals be separated?

W. H. J.

Electrostatic separation, magnetic separation and flotation are possibilities. The applicability of any of these processes to the ore in question can, of course, be determined only by experiment.

Rock Phosphate in New Jersey

Will you please advise me of the names of companies in northern New Jersey mining and milling rock phosphate for fertilizing purposes?

F. S. F.

There is no phosphate rock mined in New Jersey. The Grasselli Chemical Company, at Grasselli; the Liebig Fertilizer Works, and the Williams & Clark Fertilizer Works, both of Carteret, N. J., are all milling phosphate rock for fertilizer.

Market for Manganese Ore

Will you please furnish me with the names of buyers of manganese ores in New York? And do you know of any buyers in Boston?

E. A. S.

John S. Lamson & Bro., Maiden Lane and William street; and C. W. Leavitt & Co., 30 Church street, New York, are purchasers of manganese ores. We do not know of any buyers of such ores in Boston. In the Journal of March 5, 1910, the schedule of prices offered by the Carnegie Steel Company for manganese ores in 1910 is given, and may contain information of interest.

Purchasers of Tungsten Ores

Can you send me information regarding companies dealing in tungsten ores, and the prices paid?

W. H.

Henry E. Wood & Co., Denver, Colo., buy crude tungsten ore for concentration. The Primos Chemical Company, Primos, Delaware county, Penn., and Carnegie Steel Company, Pittsburg, Penn., are buyers of tungsten concentrates, and may buy high-grade ores. The prices for 1910 have ranged from $7 to $7.50 per unit of WO_3 in ores carrying about 35 per cent. or over of tungstic acid. In the Boulder county, Colo., tungsten field, the ores are usually concentrated on Monell tables to about 60 per cent. tungstic acid.

Rhodochrosite

I send a sample of rhodochrosite, which is the principal gangue in large veins being worked for silver and lead. I understand in Chile, that this mineral is calcined and the resulting peroxide sold. Do you know whether such is the case? Can you enlighten me as to the best way of utilizing it, and what would be paid for it?

K. N.

We have taken this matter up with several of the large chemical dealers of New York, and as far as we can discover there is no demand for rhodochrosite. Neither are we able to confirm or disprove the calcination of this mineral for manganese peroxide. While such a process seems feasible chemically, the regulation of temperature would have to be exact, and whether it would pay is a question, as manganese peroxide, running 80 to 85 per cent. pure, is worth only about $16 to $30 per ton.

Magnesia

Can you give me any idea what crude magnesia (calcined), such as is used in furnace filling and covering, will cost in lots of one ton or more?

W. C. B.

The question is not entirely clear, but if magnesia clay for use as a refractory material for reverberatory furnaces, etc., is desired, the cost will be about $32 to $35 per ton. The material is sold by the Harbison-Walker Refractories Company, of Pittsburg, Penn. If sectional pipe covering is meant, no prices can be given, as they vary according to size of pipe. The magnesia cement used for covering small furnaces in private houses costs $100 per ton, f.o.b. Brooklyn, and is sold by the Johns-Manville Company, 100 William street, New York, although they recommend the use of their asbestos cement at about $37.50 per ton, f.o.b. Brooklyn.

Bakelite

Will you please advise me what is the substance "bakelite," to which I see so many recent references?

A. F.

Bakelite (oxybenzylmethylenglycolanhydride) is a new organic synthetic product formed from carbolic acid and formaldehyde, and in the pure form of modification C corresponds to the formula $C_{43}H_{28}O_7$. It was discovered by Dr. L. H. Baekeland.

Bakelite A is a form of the substance solid at ordinary temperatures, but becomes pasty, then liquid, as the temperature is raised. It is soluble in alcohol, acetone or caustic soda. On strong heating it undergoes polymerization and changes to modification B. In this state it is infusible, but can be softened by heat and may be molded and welded while soft. It is insoluble, but certain solvents, such as acetone and phenol cause it to soften and swell. On further heating, modification B changes to modification C. Physically it now resembles amber. It is unsoftened by heat, and resists temperatures up to 300 deg. C. It is insoluble in all solvents, and is unaffected by chemicals, oil, hot water, steam, etc. It is an insulator, and can be easily machined. Bakelite will serve most of the purposes for which hard rubber and celluloid are used, although it is not so elastic as they are. In the *Journ. Ind. and Eng. Chem.*, Dec., 1910, will be found additional information.

Vanadium

Can you give me some information concerning vanadium, its occurrence, production, uses, etc.?

C. S.

Vanadium occurs in nature chiefly as the vanadates of various metals, the important exceptions being the sulphide, patronite; and a hydrated silicate of potassium, magnesium, iron, alumina and vanadium, roscoelite. The latter contains about 24 per cent. of vanadium, and is the mineral from which most of the United States production is derived. Vanadinite, $Pb_5Cl(VO_4)_3$, and descloizite $(PbZn)(PbOH)VO_4$, occur in Arizona. The usual method of extraction is a wet process closely allied to the one described briefly in "The Mineral Industry" for 1909; also in the previous volume.

The ore is roasted with salt, cooled and agitated in tanks with water by compressed air. The solution is then decanted, and the vanadium precipitated as vanadate of iron by the addition of ferrous sulphate. This vanadate of iron is afterward reduced to ferro-vanadium.

Vanadium alloys are used wherever a metal is required, which shall have the highest possible resistance to all sorts of shock. Instances are high-speed cutting steels; those parts of automobile frames which must be of small cross-section, but highly resistant; armor plate, etc.

If you have vanadium to sell we recommend communicating with the American Vanadium Company, of Pittsburg, Penn.; the Primos Chemical Company, Primos, Penn.; or the Electro-Metallurgical Company of America, at Niagara Falls.

Correction

On page 1145 of the Journal for Dec. 10, 1910, the composition of aluminum solder was erroneously given as consisting of "lead and zinc." This should have been "tin and zinc," as noted in the "Correspondence and Discussion" column, where the composition of Richard's patented solder is given. It may also be added that C. H. Land, of Detroit, Mich., claims that aluminum can be soldered by immersing the edges in molten tin and scratching with a steel scratch brush while immersed, until a coating of tin is formed. The pieces can then be soldered together with ordinary solder.

Goldfield Consolidated Mines

The Goldfield Consolidated Mines Company reports for year ended Oct. 31, as follows:

	1910.	1909.
Gross revenue	$10,273,934	$6,598,871
Net profits	7,347,691	5,026,620
Dividends	7,118,921	3,201,239
Surplus	228,770	1,825,381

In 1910 there was produced 266,867 tons of ore valued at $40.27 per ton, against 194,479 tons valued at $37.98 in the previous year. Net recovery in 1910 amounted to $10,273,934, or $38.50 per ton.

General Manager Finlay says in part: "There is reason to believe that the mine can produce from the ore now exposed a tonnage equal to about two of the year just closed. This does not measure the possibilities. It is useless to fix a tonnage without also fixing a value of the reserves. This is extremely difficult and must necessarily be somewhat in the nature of guess work.

"Five extra dividends have been declared, amounting in all to $1 per share. While these extraordinary profits have thus far exceeded expectations, and may still do so, it is not reasonable to expect them to continue indefinitely."

United Metals vs. American Smelting

The litigation which started some months ago through suit brought by the United Metals Selling Company asking for $1,000,000 damages from the American Smelting and Refining Company has taken a turn in favor of the plaintiff through an order of the New York Supreme Court, directing the American Smelting and Refining Company to produce its books. Last March the court decided that Edwin Brush, vice-president of the American Smelting and Refining Company should stand examination at the hands of the plaintiff's counsel.

This suit in detail explains much of the "bad blood" existing between the two interests, says the *Boston News Bureau*. The United Metals Selling Company formerly acted as a selling agent for the American Smelting and Refining Company, which is now alleged to have tendered the Metals Selling Company, on a declining market, copper which was not its own product, contrary to contract.

The excess deliveries upon which the United Metals Selling Company based its claims for damages were:

Feb., 1907	1,119,705 lb. @ 24.744c..	$277,060
Mar., 1907	3,374,244 lb. @ 24.94 c..	841,536
Apr., 1907	2,506,051 lb. @ 24.099c..	603,934
Total	7,000,000 lb.....	1,722,529

The original bill of complaint alleged that the selling contract between the two concerns entered into in 1901 provided for a commission of 1 per cent.; in 1903 it was further agreed that the ENGINEERING AND MINING JOURNAL weekly quotations should form the basis of settlement. Again in 1907 the contract was further modified to the extent that the United Metals Selling Company should buy all the Guggenheim production, and that the latter should estimate the output three months ahead and settlement should be made on the current figures of the ENGINEERING AND MINING JOURNAL. Under this arrangement February settlement would be for the following May production. If an excess production was forthcoming, the settlement price would be based on the month in which actual delivery was made.

The United Metals Selling Company alleges that during practically the whole life of the contract the metal market was declining and the American Smelting and Refining Company thereby through delivering copper not its own benefited to the extent of $1,000,000. On the other hand, the American Smelting and Refining Company claims that it did not receive full returns for its copper owing to misrepresentation on the part of the United Metals Selling Company.

The Hill Iron Ore Leases

The minimum named under the leases of the Hill or Great Northern iron-ore lands in Minnesota to the United States Steel Corporation for 1910 was 3,000,000 tons; the royalty for the year being 95.2c. per ton. This would make the payment for the year $2,856,000; but as the base under the lease is 59 per cent. iron, there may be some deduction on the ore actually mined. This amount, however, will not be very large. In addition to the royalty the Steel Corporation must pay the Great Northern railroad 60c. per ton as freight to Lake Superior docks on the minimum tonnage; making $1,800,000 more. This freight charge, under the contract, does not increase, but the royalty advances 3.4c. per ton each year, and the minimum increases by 750,000 tons.

For 1911, therefore, the royalty will be 98.6c. per ton, on the basis of 59 per cent. iron, on a minimum of 3,750,000 tons; the freight charge remaining at 60c., making a total payment of $1.586 per ton.

Phosphate Beds near Butte, Montana

It is announced from Washington that phosphate beds of commercial value have been found near Butte, Mont., on the public lands, which were withdrawn from entry pending legislation by Congress as to their control and disposition. The despatch states that H. S. Gale, who examined this ground for the U. S. Geological Survey, believes that these phosphate beds may be 5 or 6 ft. thick and that they are "almost, if not quite, identical with those occurring in the phoshate fields a couple of hundred miles to the south." A Survey bulletin is soon to be issued on the subject.

The Smelting Companies

The half-yearly reports of the American Smelters Securities Company and the American Smelting and Refining Company were made public this week.

AMERICAN SMELTERS SECURITIES

The American Smelters Securities Company reports for the six months ended Nov. 30, as follows:

	1910.	1909.
Net earnings	$3,099,015	$2,490,526
Construction and improvements	356,111	186,999
Balance	*$2,742,904	$2,303,527
Dividends	1,260,000	1,260,000
Surplus	$1,482,904	$1,043,527

*Equal to 3.56 per cent. on $77,000,000 stock, as compared with 2.99 per cent. on same stock in the previous year.

AMERICAN SMELTING AND REFINING

The American Smelting and Refining Company has issued a statement of operations covering the six months ended Oct. 31, 1910, which compares as follows:

	1910.	1909.
Net earnings	$3,683,941	$3,442,193
Construction and improvements	380,027	48,774
Balance	*$3,303,914	$3,393,419
Preferred dividends	1,750,000	1,750,000
Common dividends	1,000,000	1,000,000
Total division	$2,750,000	$2,750,000
Surplus	553,914	643,419

*The surplus, $3,303,914, after charging out $1,750,000, equal to six months' dividends on the preferred, shows a balance of $1,553,914, equal to 3.1 per cent., on $50,000,000 common stock, as compared with 3.29 per cent. earned on the same stock in the corresponding six months last year.

The general balance sheet of the American Smelting and Refining Company as of Oct. 31, compares as follows:

Assets—	1910.	1909.
Property	$86,845,670	$86,845,670
Investments	2,091,584	4,368,161
Metals	19,316,419	16,207,042
Materials	1,325,551	1,224,605
Net current assets	39,984	592,716
Cash and demand loans	10,871,573	9,445,379
Total	$120,484,783	$118,683,605
Liabilities—		
Capital stock	$100,000,000	$100,000,000
Bonds	121,000	237,000
Net current liabilities	.....	.....
Unearned treatment	3,012,322	2,551,917
Profit and loss	17,351,461	15,894,688
Total	$120,484,783	$118,683,605

President Daniel Guggenheim said in the report:

"It is encouraging to know that the supply of ores coming to the company is showing a marked improvement. This has resulted in a considerable increase in the amount of metals held in process, and the company has been encouraged on this account to increase the expenditures for improvement and new construction, all of which have been deducted from the profits in lieu of depreciation."

Details of Practical Mining

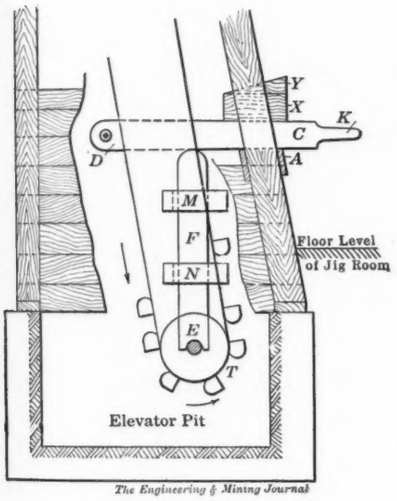
This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blue print answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Belt Tightener for Bucket Elevators

BY J. FRANK HALEY*

The accompanying sketch shows a belt tightener used at the mill of the Big Three Mining Company, at Bellville, in the Joplin district. The device is simple



ELEVATOR-BELT TIGHTENER

and can be made cheaply by unskilled labor. A piece of plank *F*, 3x6 in., and 6 ft. long, is cut on one end with semicircular surface. The other end is cut out to fit around the shaft of the tail pulley. This is held in a vertical position by the slot guides *M* and *N*, which are nailed to the housing of the elevator. Resting on the upper end of the piece *F* is a piece 3x6 in. x 8 ft. long, one end of which is bolted to the housing at *D*. At about one-third of its length from *D* it rests on the piece *F*, leaving two-thirds of its length as a lever arm, the other end of which is shaped with a handle. The piece *C* works in a slot in the front of the elevator housing facing the jig-room floor and 3 ft. above the floor. It is held in position above by the square piece *X* and the wedge *Y* and below by the piece *A*, nailed across the front of the housing.

The operation is simple. When the belt becomes loose the piece *A* is removed. Pressure is then applied at *K* and the pieces *X* and *Y* are driven in until sufficient slack is taken up in the belt. The piece *A* is then replaced, holding the entire device rigid. The shaft *E*, of the tail pulley, runs in the slots at the bottom of the piece *F*, thus doing away with babbitt bearings, which give so much trouble in belt tighteners of the screw variety.

*Mining engineer, Joplin, Mo.

Faulty Sampling Device

BY LOUIS D. HUNTOON*

In the JOURNAL of Dec. 10, page 1146, is described a simple sampling device used at the Crown Reserve mine, Cobalt, Ont. From the sketch and description of the sampler I doubt very much if an accurate sample can be obtained. The sampler fills the requirement of cutting the entire stream, but does not fill the requirement of taking all the stream part of the time. In the flow of ores or tailings, the rich mineral will concentrate on the bottom of the chute. The cylinder must project more or less into the chute, due to the curved surface, so it will act as a riffle, tending to concentrate and bank the rich ore just in front of the sampler. As the opening in the cylinder revolves into the chute, the bank of concentrates will be discharged into the cylinder. As it continues to revolve some of the coarse ore will also be discharged. The half-inch slit is so narrow that the surface water containing the slimes will hardly have an opportunity to enter the sampler. If the above is true the sampler cannot take an average sample.

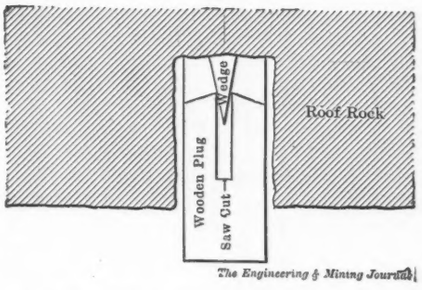
I am calling attention to this as some mill superintendent might install such a sampler on account of its simplicity, not realizing that there is a great possibility of erroneous results. A few years ago I visited a large mill where the original and duplicate tailings samples never checked, and the reputable assayers to whom the samples were sent were held responsible. Investigating their method of sampling, I found the errors were due to coning and quartering and the overloading of flat-bottomed riffles. There are on the market a few accurate tailings samplers, just as simple as the one described.

*Professor of mining and metallurgy, Sheffield Scientific School of Yale University, New Haven, Conn.

Anchoring Plugs in Tunnel Roofs

BY S. H. HAMILTON*

One of the annoying things an underground surveyor frequently encounters is the dropping out of the plugs set for roof stations. Although the plug may be cut so it can only be driven in with considerable force, yet it may, especially in a dry mine, drop out in course of time. A method of permanently holding plugs not only for spuds but also for electric wires is shown in the sketch. The plug fits the hole easily, and has a saw-cut or split on the upper end. In this crack is placed a wedge of wood



PLUG FOR MINE SURVEYOR'S SPUD

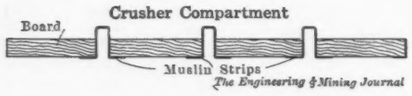
or metal. The plug is then placed in the hole and a few blows with the hammer causes the wedge to spread the plug so that it will be held permanently in place.

The following are typical mill wages in the San Juan region, Colorado: Amalgamators, $5.50 and $5; machinists, blacksmiths, millwrights and carpenters, $4.50 (nine-hour day); solution men, $4 and $3.75; battery men (without helpers), and pipefitters, $3.75; Huntington-mill, plate, vanner and dryer men, $3.50; pipefitters' helpers, $3.25; crusher men, firemen (eight hours), $3; laborers, $3, nine-hour shift.

*Mining geologist, 29 Broadway, New York.

Dust Proof Housing for Dry Crushing Plants

The most satisfactory scheme for abating the dust nuisance in mills is to house all dry-crushing machines in tight compartments. With the unseasoned wood that is available in Western mining camps, it is, however, absolutely impossible to build a plank partition, even of tongue-and-groove material, that will remain dust-proof after seasoning and the resulting shrinking and warping takes place. This difficulty may be overcome in the following manner. All dry crushers are inclosed, ordinary boards, which need only be dressed on one side, being used for building partitions. Narrow cracks are left between the edges of the boards and strips of muslin then pasted over each joint of the partitions. The strips



SCHEME FOR DUSTPROOFING CRUSHER COMPARTMENTS

are not stretched tightly across the cracks but slack is left and this loose cloth is tucked into the cracks between the boards, by simply running a dull knife blade down the cracks. Then as the boards shrink with seasoning, the slack of the muslin strips is taken up without any openings developing through which dust can fly. As the loose cloth is tucked through the cracks in the partitions the appearance on the outside is not unsightly. The accompanying drawing illustrates the idea of the construction, which is also particularly adapted for inclosing rooms where samples are handled.

Classification of Excavated Material

The classification of material excavated is frequently a matter of contention. The *Contractor* quotes recently a set of specifications copied from a railroad contract, which attempts a new classification:

All excavated materials shall be classed under three heads, namely: Earth shall include all clays, indurated or otherwise, disintegrated shale and other rock that partakes of an earthy nature, and all other materials which can be loosened by a pick or plow, one picker keeping two shovelers busy, the plow to be a railroad plow drawn by four draft animals, weighing on an average 1000 pounds.

Loose rock shall consist of all boulders and masses of rock, disintegrated or otherwise, whether stratified or not, that can be removed economically by the use of a pick or bar, although blasting may be resorted to in order to lessen the cost to the contractor, or hasten the progress of the work.

Solid rock shall consist of all boulders and masses of rock, whether stratified or not, which can only be removed by blasting, and must after blasting be blockholed.

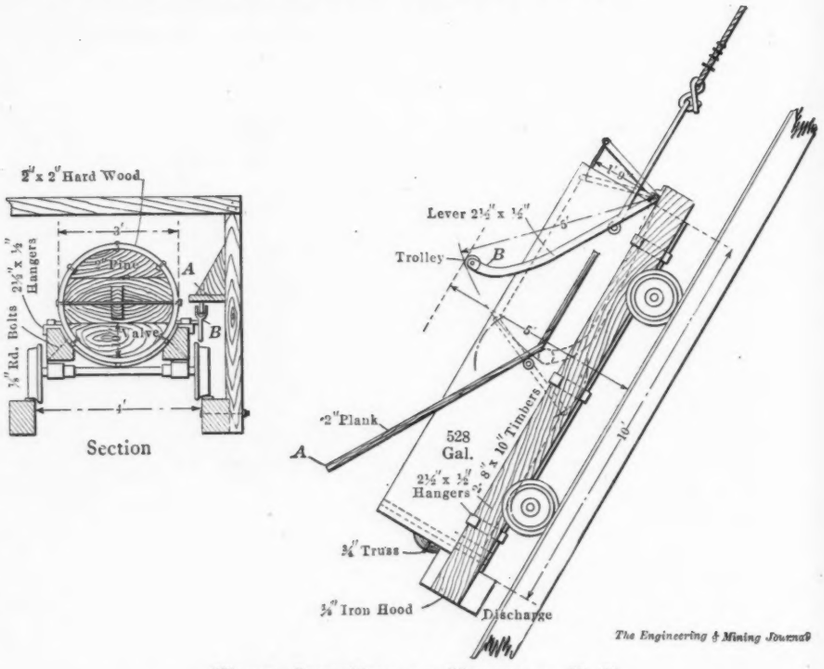
A Two Ton Water Car

BY GUY C. STOLTZ*

The accompanying illustration shows a water car used at Mineville, N. Y., to unwater Mine 21. Two cars of 528-gal. capacity were hoisted in balance an average distance of 450 ft. on a 60-deg. double-track incline. They were automatically filled in the mine and automatically discharged at the surface into a series of wooden troughs. The greatest number of cars hoisted during a 10-hour shift was 812, while 600 was the average rate per shift. The hoisting capacity at maximum speed was equal to a pump fitted with a 10-in. discharge delivering 715 gal. per minute. The average quantity hoisted was 528 gal. per minute. The water tank was made from a 10-ft. length of 3-ft. stack, the lower end headed with 2-in. pine and held in place by a 2x2-in. hardwood ring which was bolted to the circumference of the stack at the bottom. The top was not headed. The bottom timber head was reinforced at its center by a truss of ¾-in. iron bearing on a 4x4x12-in. wooden strut.

The tank, which was attached to a set of wooden stringers by flat iron hangers, was mounted on the ordinary skip axles. The lower 10-in. segment of the tank door was hinged and upon lowering the car into the water the pressure would automatically open the segment and allow the water to enter. As the car was hoisted above the level of the water the door would close due to the hydraulic pressure of the contents.

The door was automatically opened at the dumping point on the surface by the operation of a system of lever arms. These were attached to the door and so pivoted that a plank guide *A* would intercept the trolley arm *B* and lower it to such a position that a lateral movement of 8 in. toward the top of the car would be delivered to the gate. Upon lowering the car the gate, which was heavier than the reciprocating system of levers, would close. Back rails should be provided to prevent the car from leaving its track as it enters the water.



WATER SKIP USED AT MINEVILLE, N. Y.

*Mining engineer, Mineville, N. Y.

Danger from Deteriorated Insulation of Conductors

The abrasion of insulated cables in a mine is a matter for serious consideration. If cables are dragged daily through the stopes, the insulation would soon become damaged, and this, added to an occasional blast and other rough usage, would cause the handling of the cable to be of considerable danger. R. G. Mackie[1] says the accident rate would increase, and the maintenance probably become prohibitive.

The numerous disadvantages would require consideration before installing electrical power for stoping purposes on the Rand. The ignorant human element would be the cause of great

[1]*Journ.*, Transvaal Inst. Mech. Engrs., Oct., 1910.

anxiety to mine officials. The principal danger, therefore, resultant on the distribution of electricity in these mines, is the possibility of persons coming in contact with live wires, due to damaged insulation.

Driving in Loose Ground

By George J. Young*

In driving a drift through loose or running ground fore-poling is commonly resorted to. A modification of the method, in use on the Comstock lode, is worth bringing to the attention of the readers of the Journal.

The method is of particular utility where the drift must be supported by face boards. Ordinarily two settings of the face boards are required for each advance of one set of timbers, the first setting just beyond the position to be occupied by the false set, the second just beyond the regular set.

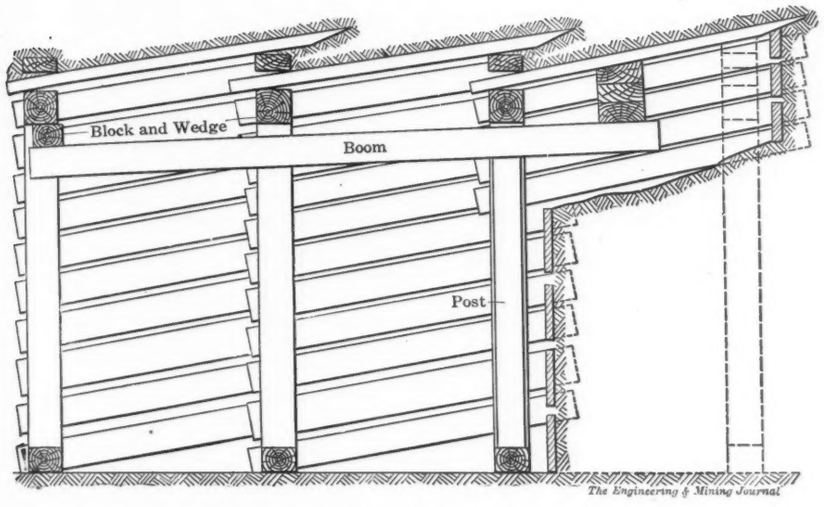


Fig. 1. Boom Method of Timbering in Drifting through Heavy Ground

In the Comstock modification the top laths are driven one-half their length, the upper face boards being removed and the loose ground carried at such an angle as to prevent it from running into the drift. The laths are then supported by a "boom," which is a wooden lever, an 8x8-in. timber, 9 to 10 ft. long. The boom rests upon the post which acts as a fulcrum and one end carries sufficient blocking to catch up the top laths, the other end being held down by blocking and wedges between the end and a neighboring cap. The boom is rigged along the center of the drift. The top and upper side laths are then driven forward to their full length and the upper face board placed in position. The remaining side laths are then driven successively and the face boards placed in position. On the completion of the advance the next regular set is placed. A single setting of the face boards thus secures an advance of one regular set. In square-setting old fillings the boom is also used and obviates the necessity of putting up temporary props in the working space.

Sketch 1 shows the method of rigging the boom. A modification is suggested in Fig. 2. In this a heavy iron hanger takes the place of the post and serves as a fulcrum. It has the advantage of giving more room at the face.

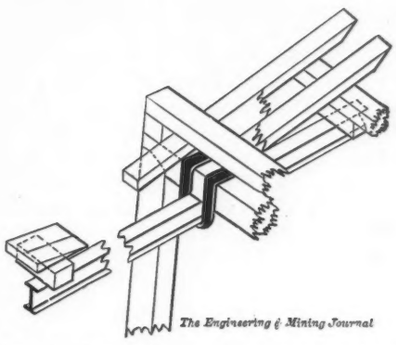


Fig. 2. Scheme for Supporting Boom with Hanger

In the central mining counties of California in the palmy days of hydraulic mining, the ditch systems for providing water were extensive and costly. When the hydraulic mines were enjoined and ceased work, improvements on the ditch and reservoir systems stopped also. Later, however, the consumption of water began to increase owing to the establishment of hydroelectric generating stations, and the development of deep mines using water to operate hoists, pumping plants, etc. Large quantities of water are also now sold for irrigation purposes. As a result, the ditch and reservoir systems of some of the old hydraulic mines are now worth more than was the former plant.

*Professor of mining, University of Nevada, Reno, Nev.

Water in Converter Air Mains a Source of Danger

By A. R. McKenzie*

That all atmospheric air contains a certain amount of moisture is a well known fact. The quantity of this moisture per unit volume varies with the locality, the seasons, barometric pressure, temperature, etc. The higher the temperature of the air, the greater the capacity it has for carrying moisture in the form of vapor, for example: At 32 deg. F., saturated air carries 2.13 grains of water per cu.ft.; at 50 deg., 4.10 grains; at 60 deg., 5.77 grains; at 70 deg., 8.01 grains; at 80 deg., 10.98 grains; at 90 deg., 14.85 grains; at 100 deg., 19.84 grains.

Consequently if air saturated with water vapor at a higher temperature is compressed, and while being transported for any distance, has its temperature materially lowered, there is bound to be a condensation of moisture. In the compression of air for converter work, under conditions as above, there is an element of danger presented.

Danger Not Merely Theoretical

During my experience in copper converting, at least two glaring instances of this phenomenon have come to my notice. An exaggerated case of this occurred about four years ago, at a smeltery situated in a high altitude. The power house at this plant was about 1000 ft. away and situated on the same level as the blast-furnace feed floor. From the power house the converter air main passed through a tunnel in the brow of the terrace to within 70 ft. of the furnace building, whence it passed diagonally across to the outside of the converter-crane track, where it entered the converter building; from there it was curved downward to the level of the mouth of the converters, when they were in an upright position in the stalls. Before reaching the converters the pipe was enlarged to a diameter of about five feet, which answered the purpose of a receiver or reservoir. The connection to each converter was made from the side of this reservoir, which ran along behind the converter smoke boxes.

One rainy day about two o'clock in the afternoon, four months after the plant had been in operation, I noticed water coming out of some tuyeres that were leaking air around the ball valves. I immediately had all the converters shut down, in order to ascertain the source of this water. On account of the rainy weather, my first supposition was that the water had got to the intake of the compressor and was being pumped to the converters with the air, but I soon discovered that such was not the case. I next made an examination of the five-foot

*Great Falls, Mont.

reservoir by tapping it with a hammer. From the sound I judged it was full of water up to the outlets, where the side connections were made to the converters. A scaffold was hurriedly built and an air-power drill set in place. In a few minutes a stream of water was running from an inch hole in the bottom of the reservoir, the total amount of water drained from this pipe amounting to about 100 bbl. Afterward I had this hole fitted with a 1-in. drain pipe, with a valve which was kept slightly open to prevent a recurrence of what had taken place.

Bleeders Should be Provided in Converter Air Lines

In the design of converter plants, care should be taken not to tap the converter air main from the bottom, for in case one of the converter stalls should be shut down for any length of time, the air pipe leading from the air main to the stall might fill with water, and in again putting this stall in operation, there would be danger of an explosion unless the collected water were removed. The difference in temperature between a hot engine room, where a number of machines are running, and the outside atmosphere, is so great, especially in cold weather, that condensation of moisture in the pipes goes on rapidly, and may become a source of danger in any case unless special means of drainage are provided. It may be thought that, in plants in continuous operation, enough water would never come through the main to cause an explosion, even without any special means of drainage, but the following case may be assumed to show such danger exists.

Carrying Water into the Converters

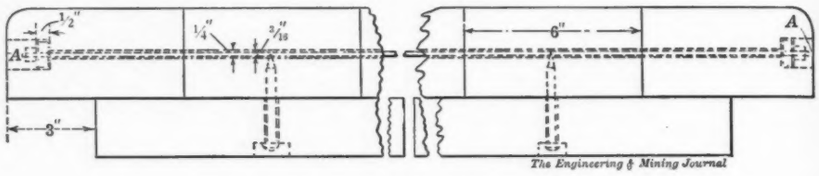
Suppose that one or two converters have been running for some time, and that some condensation of water has taken place in the air main. Then, should the number of converters be increased to four or five, as frequently happens in meeting changing requirements of production, etc., the volume of air passing per minute will be perhaps doubled, tending to form waves and to sweep it into the connecting pipes, whence it will pass into the converters and cause an explosion. During intermittent operation there is no question of the danger. Some years ago, at another plant at which I was employed, a stall which had long been idle was again put into service. The converter was connected in place and charged, without examining the piping, which had slowly collected condensation water back of the valve. On turning into the stack and putting on the air, this water was carried into the tuyeres and blew the converter bottom to pieces, illustrating the extreme danger of allowing water to collect in the air system.

Sectional Drawing Board

By Lee Fraser*

The design of drawing board, shown in the accompanying sketch, commends itself under numerous conditions which will try the merits of the usual pattern, especially if it be a large one. I refer especially to conditions in the tropics, where the vagaries of humidity may open a crack half an inch in width in a drawing board, and then close it so tightly as to warp its surface. Again, it may be desired, though perhaps not often, to transfer a board from one point to another, where the ability to break it up, without disastrous effects, facilitates the carrying or shipping of what otherwise would be a cumbersome load. And again, it is often the case that perfectly seasoned lumber cannot be secured. In fact the principal feature of this design of drawing board is its general adaptability to any variety of conditions.

As shown in the sketches, the board is built up of several pieces. Holes are bored through the center of each piece, across its width at the points through which it is desired to pass the connecting rods, and inserts *A* are made in the outer edges of the sides, to hold the steel washer plates and give protection from the projecting ends of the rods. A key should be made to turn the nuts on the connecting rods. When the table has been tightened and is in place, any irregularities may be easily removed by using a surfacing plane.



Details of a Built-up Drawing Board

Thawing Dynamite

A simple, economical and perfectly safe method of thawing dynamite is that which has been used for over a year at the Van Roi mine, near Silverton, Slocan district, B. C. Douglas Lay, superintendent of the mine, describes this as being merely an adaptation of the widely known principle of heating by hot-water coils.

The thawing house is a building occupying a floor space of about 8x10 ft. Placed in it is the water-supply tank—a barrel—kept full, or nearly full, of water, which is heated by means of pipes passing to a coil in a stove in another building about 300 ft. distant from the thawing house, and at a considerably lower level. The pipes from the barrel, which connect with the stove coil, are placed in a box buried in the ground, to insure insulation. In the thawing house there is a box 5 ft. long, 2 ft. wide and 2 ft. deep, with a lid. A large pipe coil, connected with the hot-water column, is in the bottom of the box; it is covered with sawdust, and the sticks of dynamite are placed in the box. The sawdust serves to absorb any exuded nitroglycerin, and is renewed frequently. The building containing the heating stove and coil is erected near the entrance to one of the mine adits and is used as a dry room by the miners. As already mentioned, it is remote from the thawing house, so that the latter would be absolutely safe, even if, from any cause, the former should catch fire.

*Mining engineer, Puntarenas, Costa Rica.

Testing Filter Press Tail Solutions

The man tending the precipitation boxes or the zinc presses in a cyanide plant, if zincdust precipitation is used, desires often to know approximately what the tail solutions are assaying. The following handy color method is used at the cyanide plants of the North Star Mines Company at Grass Valley, Cal. The method is easy to manipulate, and after the person using it has gained experience, he can approximate closely the gold content of the solution.

The method consists of passing hydrogen-sulphide gas into a slightly acid sample of the tail solution. The acidity of the solution keeps the zinc and other sulphides from precipitating that might interfere with the test. The alkalinity of the solution is determined on a small portion by the well known phenol test. In acidifying, chemically pure hydrochloric acid is added, but in the hydrogen-sulphide apparatus commercial acid may be used. If desired hydrogen-sulphide gas can be passed into the solution before acidifying, but it is better to acidify the solution first so as to keep the zinc from precipitating. A large-sized test tube is used to hold the solution, and an ordinary Florence-flask apparatus for generating the hydrogen sulphide. By the yellowness of the acidified solution after the hydrogen sulphide has been passed through for say 10 min., the value of the solution in gold can be guessed fairly closely. This method was suggested by D. N. Hood, at one time in charge of the cyanide plants of the North Star company.

Transvaal Stope Drill Competition

During the last 15 years there have been several attempts made on the Rand to determine the efficiency of rock-drilling machines, the particular objective being to decide the relative merits of various types of machine or to establish the actual cost of machine drilling in comparison with holes drilled by means of hand labor.

Abstract of the report of the joint committee on the Transvaal stope drill competition. Of nineteen drills entered, four completed the contest: The Holman 2⅛-in., Siskol, Holman 2¾-in. and Chersen.

The first prize of £4,000 and second of £1,000 were equally divided between the Holman 2⅛-in. and Siskol drills; the former drilled a total of 12,779 ft. compared with 14,083 for the latter; the costs per foot were 9.77d. and 9.90d. respectively.

Hammer-type drills and those using water attachments were not suitable under the local conditions.

Historical

In February, 1898, a test was conducted at the Rose Deep, Ltd. Thirty-one reciprocating machines of sizes varying from 2½ to 3⅜ in. diameter (and averaging 30.9 machines of 3¼ in.) were run on ordinary work in this mine for six hours with air from a double-stage air compressor. The footage of the 30.9 machines averaged 26 ft. 10.4 in. per machine in six hours. That is 0.9 in. per minute of total time of practical trial underground. The volume of free air, compressed to an average pressure of 69.83 lb. per sq.in. and ranging from 48 to 95 lb., used per minute per 3¼-in. machine was 81.08 cu.ft. The air was measured from the first-stage air cylinder card (88.4 per cent. of the theoretical cylinder volume) and included all leakage and all "blowing out" when the machine was not actually working. The test was only run for six hours. The result which gained the prize was 51 ft. 9 in. (9 holes) drilled by one operator with one machine in six hours, or 1.72 in. per min. over the total time that started from a clean set up.

The 1904 Contest

The next rock-drill contest took place early in 1904 at the City and Suburban Gold Mining Company. These trials were carried out with great care and impartiality with the object of obtaining information concerning the quantity of air consumed by different makes and sizes of rock-drilling machines while doing a given amount of work at various air pressures. The granite used came from the same quarry as that used for the trials at present being reported, but the block was set flat in the ground and the holes drilled vertically downward, the depth of the hole being not greater than 21 in. The air was measured from two receivers and temperatures were carefully recorded; the capacity of the two receivers being 756.6 cu.ft. The machines were worked for short periods of time (five or six minutes), corresponding to the time taken to lower the pressure in the receivers a stated amount as from, 80 to 70 lb., and from 70 to 60 lb., etc.

The size and depth of hole drilled was measured for each drop of 10 lb. pressure from 80 lb. downward. In these tests the variation of air consumption was from 69.2 to 168.6 cu.ft. of free air per minute of actual drilling time, the actual average over-all stages being 96.1 cu.ft. of free air per minute. It was also shown that 105.2 cu.ft. of free air was required if compressed to 70 lb. per sq.in. to run a 3¼-in. drill for one minute, 95.6 cu.ft. for a 3-in. machine, 88.1 for 2¾-in and 68.2 cu.ft. for a 2¼-in. machine.

Air Used by Small and Large Drills

These tests, in so far as their limited character allowed of any conclusions being drawn, also went to show that a small machine of 2¾ in. diameter using a 3 1/16-in. bit, removed considerably more ground per cubic foot of free air than a machine of the larger type, and also that the cubic foot of free air used per inch drilled, kept fairly constant at all pressures, due allowance being made for the blunting of the drills. The first two stages from 80 to 70 lb. and 70 to 60 lb. represent one hole, and the stages 60 to 50 lb. and 50 to 40 lb. represent a second hole. The air consumption per foot drilled in these various stages averaged 1074 cu.ft. for the first stage, 1259 cu.ft. for the second, 1087 cu.ft. for the third, and 1292 cu.ft. for the fourth.

The 1907 Contest

Toward the close of 1907, trials were conducted at the Robinson Gold Mining Company and consisted of two stages; at the surface, one hour's drilling on each of four granite blocks at 50-lb. air pressure and a repetition on the following day at 60-lb. pressure. The faces of three of the granite blocks were set at an angle of 25 deg. to the vertical and the fourth block vertically; the holes had to be drilled at right angles to the faces of the blocks; only one operator was allowed to each machine and no assistance was permitted. The weight of the machine was limited to 130 lb. Underground, the test consisted of drilling eight down-holes at the angle of the reef on the first day, and eight up-holes also on the angle of the reef on the second day, both tests being carried out at a constant air pressure of 60 lb. per sq. in. Nine machines took part in these trials, five of which were of the hammer type and four of the ordinary reciprocating type. The hammer type varied in size and weight from 1.8 in. diameter by 1⅜ in. stroke and 44¼ lb. weight, to 3⅛ in. diameter by 3 in. stroke and 100 lb.

RESULTS OF TRANSVAAL STOPE DRILL COMPETITION, 1909.

Machine.	Footage to Count. (1)	Footage per Shift for Two Machines. (2)	COSTS. White Labor. (3)	Native Labor. (4)	Air. (5)	Drill Sharpening. (6)	Drill Steel. (7)	Spares. (8)	Stores. (9)	Depreciation of Machines. (10)	Total. (11)	Cost per Foot Drilled. (12)	Relative Costs for 14,083 Ft. Drilled. (13)
			£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	d.	£. s. d.
Holman 2⅛"	12,779	59.4	107 10 0	133 1 1	91 6 3	53 4 11	26 12 6	24 11 0	22 17 11	60 18 9	520 2 5	9.77	573 5 11*
Siskol.....	14,083	65.5	107 10 0	131 5 6	91 3 10	58 13 7	29 6 10	74 10 0	30 5 0	58 6 3	581 1 0	9.90	581 1 0*
Holman 2¾"	11,744	54.6	107 10 0	139 18 5	91 9 11	48 18 8	24 9 4	46 7 0	24 10 10	50 18 9	534 2 11	10.91	640 3 9
Chersen....	11,781	54.8	107 10 0	135 4 4	78 14 5	49 1 9	24 10 11	124 11 0	24 3 3	42 11 3	586 6 11	11.94	700 12 7

*Divided first and second prizes.

weight. The reciprocating machine varied from 2 in. by 5 in. and 97½lb. weight, to 2¼ in. by 5 in. and 129½ lb. weight.

The Gordon Hammer Drill

The Gordon hammer drill which won the competition weighed 72⅝ lb. and was 1 13/16 in. in diameter by 10 in. stroke. Its performance was good, the particulars of which are: At the surface, at 50 lb. pressure it averaged 1.42 in. per minute of total time or 1.62 in. of actual drilling time; at 60 lb. pressure, it averaged 1.8 in. per minute of total time and 2.13 in. of actual drilling time. Underground, in dry holes 1.74 in. per minute of total time, and with wet holes 1.82 in. per minute. After these trials the Gordon drill was found, in actual service underground, to be unreliable. The pistons and anvil blocks had but a short life, and the drills used frequently broke or stuck in the holes and the machine entirely failed to fulfil expectations.

The 1909 Contest

At the annual meeting of the Chamber of Mines in February, 1908, the chairman made the offer to award a prize of £2500 for the best small drilling machine that could be produced for mine work on the Rand. The Transvaal Government then offered to double this amount and also agreed in combination with the Chamber of Mines to promote a competition, the prize fund of which was to be £5000 and the running cost of which were to be borne by the Government and the Chamber jointly.

Elimination trials were decided on to precede the competition to reduce the final entries to a number that could be conveniently handled and to save unnecessary expense. In the competition it was arranged that two machines of each entry should be run for 300 shifts, an equal number of which shifts were to be served in each of the working places selected. During the elimination trials the competitor was permitted to supply his own operator, but in the competition it was considered more desirable that the machine should be worked by operators selected by the committee. The machines not eliminated or withdrawn before the end of the competition were all of nearly 100 lb. weight, the lighter machines having proved ineffective. The limits of pressure for compressed air were fixed at from 60 to 75 lb. per square inch.

Nineteen Drills in Competition

The competition was started in May, 1909, and was not expected to last much longer than six months, but this time was drawn out to nearly a year. Of the nineteen machines that were delivered for the test, nine were disposed of at the elimination trials. The ten remaining were the Holman 2⅛ in., Holman 2¾ in., Siskol, Climax Imperial, New Century OO, Konomax, Chersen, Waugh, Murphy and Westfalia. In the estimates, the cost of drill steel has been taken at ½d. per ft. drilled, and the cost of sharpening at 1d. per ft. The experience during the competition would point to a much higher figure for the cost of steel, but there is no doubt that a large number of the jumpers provided for the competitors were mislaid and became mixed up with the mine stock. However, the actual cost of steel is a figure which affects both results similarly, and it may therefore be reckoned as an important fact established by means of this competition that machine drilling in moderately narrow stopes costs no more, and perhaps even less, than hand drilling by natives.

First and Second Prizes Divided

The committee having carefully considered the results, made the recommendation that the first and second prizes should be divided between the Holman 2⅛-in. and the Siskol drills. It will be seen that the latter machine drilled more footage, but cost more for spares, but the costs per foot drilled were so remarkably close that it was considered that the machines could fairly be said to have tied.

The points to be noted in connection with the four machines which worked to the close of the competition are as follows:

The Holman 2⅛-in. seemed a little too small, but it drilled well, was easy to handle, and its maintenance was the lowest of any machine, which fact largely assisted in keeping it in the leading position.

Both the Holman 2¾-in. and the Chersen have a common fault, in that the travel of their valves is very small and easily interfered with by dirt. They also do not drill well in awkward ground, and were liable to "fitcher" and stick, thus giving considerable trouble.

The Siskol was of a very convenient size, drilled fast, and used a moderate amount of air. Its cradle was faulty in design, as no arrangement had been made for adjustment after wear in the slides, or the feed-screw nut. Its long stroke and length of feed assisted it in drilling deep holes, often up to six feet. Its maintenance was heavy, especially in the front-head bushing and chuck. The operators found this machine easy to handle, and they liked it. The New Century OO machine, which worked until almost the close of the competition, was, like the Holman 2⅛-in., rather too small and wanting in power. Its feed screw and cradle were too short, necessitating the use of five drills to drill a 4-ft. hole, thus making extra cost in transportation and in sharpening drills.

The Ore Recovery Company, Albany, N. Y., and Pottstown, Penn., is erecting on the property of the Warwick Iron and Steel Company, Pottstown, Penn., an improved nodulizing plant for the utilization of furnace flue dust.

Duty on Lead By-products

The Board of General Appraisers on Jan. 12 rendered a decision on the protest of the American Smelting and Refining Company against a decision of the collector of customs. In this case an importation of lead bullion was made, upon which duty at the rate of 2⅛c. per lb. on the lead contents was assessed; it was regularly placed in a bonded smelting warehouse, and eventually a withdrawal was made for consumption of 114,816 lb. alloy metal, the residuum obtained in the ordinary commercial smelting of lead bullion, and the by-product remaining after the refined lead and precious metals had been extracted; upon which duty was assessed and paid at the rate of 2⅛c. per lb. on the weight of the withdrawn quantity.

This alloy metal is shown to consist of lead and antimony, and to be in fact an antimonial lead. The composition is from 79.65 to 82 per cent. lead, from 15.45 to 17.85 per cent. antimony, etc.

The importers claimed that the only duty that should have been levied on the withdrawal of the alloy metal by virtue of the provisions of section 24 of the act of Congress of Aug. 5, 1909, is that of 1½c. per lb. on the lead content under the provision for type metal. The protestants also urged that they oculd have procured the lower duty by withdrawing the merchandise from bond for export and then reimporting the goods into the United States as type metal.

The Board of General Appraisers set aside the protest and affairmed the duty of 2⅛c. per lb. on the lead contents, holding that the duty accrued upon the importation of the bullion, and that any subsequent change in condition could not impair the right to collect the full duty, unless it was specially provided for in the statute. In other words, that a refined product of a crude metal withdrawn from a bonded smelting warehouse is subject to the same rate and amount of duty as when in the crude state.

Errata

In the Journal of Jan. 7, an error was made in the article entitled "Arkansas Diamond Field in 1910" on page 6, second column. The sixth line should read: "in sections 21 and 28, T-8-S, R-25-W."

In the article entitled "Chilean Nitrate Outlook" on page 110 of the Jan. 14 issue, the quotation beginning at the eighth line should read: "The world's consumption was 4,399,698 tons for the first nine months of 1910 against 3,612,020 tons for the same period in 1909." Mr. Masters in his letter shows that these figures sent by United States Consul Winslow were in error, probably arising from mistaking the Spanish quintal of 46 kg. for the metric quintal of 100 kg. and giving a total proportionately too large.

Improvements in Hoisting Cages

By James J. Smith

Details of simple arrangements which will render accidents less common. Compression springs better than torsion springs on safety dogs. Detaching hooks and bell found advisable in connection with safety dogs. Compresssive stresses in cables cause breakage near skip bail. Trouble eliminated by safety chains.

The drop-bottom type of hoisting cage is well known to most mining men. The central idea is that when the cage is hanging on the rope, the central portion of the platform, containing the wheels of the mine car, shall be below the outside portion, which makes a retaining guard for the wheels and prevents the car from moving in either direction, during the hoisting period. The central portion of the cage bottom, with its car track, is supported underneath by I-beams, the ends of which pass through slots or guides attached to the side frames of the cage in which the beams have about one foot of vertical play.

Landing Chairs

To bring the drop-bottom up level with the rest of the cage platform so as to permit the removal of the car at the top, the cage is overwound about two feet. The landing man then throws a lever which brings chairs in position and the cage is lowered to these. Four chairs come immediately under the four corners of the cage, while four others come under the I-beams supporting the drop bottom. The first four are plain. The latter four constitute dashpot cylinders, and carry springs which serve the double purpose of helping to cushion the weight of the car on the drop-bottom and of pushing out the piston of the dashpot when the cage is again hoisted. The drop-bottom strikes first on the dashpot arms, which absorb the shock due to its weight, and when the rope is slack, the cage is supported on the eight arms with the drop-bottom level with the main platform. At intermediate levels on the shaft similar landing chairs are provided, while at the bottom level, the only equipment necessary is a foundation of timbers which catches the drop-bottom and supports it so that the main platform comes down level with it.

Increased Safety

This constitutes an excellent arrangement, and only one man is required to throw the chairs in and out. He is necessarily employed to look after the cage and can readily do this without loss of time. At the intermediate levels, the chairs have to be changed only when making a change in the level from which the hoisting is done. The safety secured by this device is so great that whatever drawbacks it may have should be cheerfully endured. The cages, as well as the rest of the hoisting equipment, were furnished by the Vulcan Iron Works, Wilkesbarre, Penn., and have proved satisfactory in operation, except in two details.

Compression in Cables Causes Breakage

When the cages were installed the jaw on the hoisting rope took hold of the drawbar of the cage directly, and the safety chains were fastened to a grip just above it, a construction which would at first sight appear satisfactory. But as the cages have drop-bottoms it is necessary to hoist them about two feet above the landing, and as the ropes are adjusted to bring one cage at the bottom or intermediate level when the other is at the top, this means that the descending cage will stop when the ascending cage has still two feet further to go.

After the stopping of the descending cage with its counterweight effect, the difference in the running of the engine is considerable. It is preferable that the engine shall not be running "dead slow" at the time of landing on the bottom, but that it should have enough momentum to assist in bringing the ascending cage to the required hight without putting on more steam. The result is that the descending cage strikes its supports with an appreciable, though not serious, blow. No harm is done to any part of the cage by this blow, but the lower end of the cable is suddenly thrown from tension into compression; and up to a point far enough from the cage for its flexibility to allow it to deviate from the plumb line in which it was hanging at the instant of striking the bottom, it receives a heavy blow. The energy expended is equal to the entire mass of the vertical portion of the cable, multiplied by half the square of its velocity. The drawbar of the cage has about six inches of motion, but as the rope has to descend about two feet, this is of practically no effect in absorbing the endwise blow on the rope.

The result of this blow was that the ropes began breaking immediately at the base or upper end of the socket. When it was first noticed, the reason was of course not perceived at once. The rope was cut off and the socket moved up. This, however, on 1¼-in. steel rope is a job consuming some time and high priced labor, and when it is required to be done at intervals of two months or so, it is a sufficiently serious evil to be worth correcting.

Chain Used to Take up Slack in Cable

Accordingly the use of a chain sufficiently long to take up the overwinding of the opposite cage without bringing the end of the rope into contact with its own cage was decided upon. In carrying out the idea a piece of chain four feet long was used, of a strength equal to that of the rope, and the safety chains were lengthened so that they would reach their point of attachment in the new position, Fig. 1. This change was made about three years ago, and no further trouble from the cause mentioned has ever arisen. The arrangement is extremely simple and may save someone, installing cages of this description, the trouble of making the change while in operation.

Safety-dog Springs

The next point noticed was that the safety dogs intended to grip the guides in case the rope broke or became slack, were not working. These dogs are the ordinary form of toothed spiral mounted in pairs at the ends of parallel shafts on opposite sides of the wooden guides. The hub and central rib of one of these dogs can just be seen in the extreme left-hand corner of Fig. 1, while a part of the arc of the spiral can be seen at the opposite end of the shaft on the right-hand side. These dogs are supposed to be thrown in by helical springs surrounding the dog shaft. These are torsion springs bent out at each end into a sort of "crank pin" parallel to the axis of the spring, one of these crank pins being held in the cage frame, the other in the hexagonal collar shown on the shaft just inside the springs at each end.

On one occasion when the cage stuck at a tight place in the shaft, owing to a squeezing of the buntins, these dogs failed to act as they should, and while no serious consequences resulted it was thought well to heed the warning and hold an inquest over the reason for

their failure. It was soon found. The rope is attached to the central drawbar which is connected by links to arms on the dogshafts, as shown in Fig. 1. The alternate hoisting and landing of the cage cause the drawbar to work up and down, which oscillates the dogshafts each reversal. This constant working back and forth broke off one or the other of the crank-pin ends of the springs. This could not be determined without close examination because everything was held absolutely to its place, but the springs were useless.

Owing to the construction, the dogshaft passing through the main frame of the cage, it is an extremely tedious job to renew these springs. It was done as soon as new springs could be obtained, but subsequent examination showed that these had broken likewise after relatively short service. Moreover, the conditions of the accident before mentioned showed that these springs would have been too weak, even had they not been broken. The reason for this is in the weight of the rope.

Cable Sometimes Prevents Dogs from Acting

At the hoisting plant under consideration, the cages are landed at the top of a high bin, while the winding drum is 40 ft. below the top of the bin. The headframe is amply high to allow for overwinding. Consequently at the top of its travel and for a distance of 40 ft. below, the unbalanced weight of the rope on the engine side exerts an upward pull on the drawbar of the cage, while, of course, after the cage is 40 ft. below the top landing, the net weight of the rope is exerted increasingly in the other direction. If for any reason in lowering, the cage were to stick just below the top of the bin and the engine continued to unwind, the greater weight of rope being on the engine side of the head sheave, it would simply coil up on the ground, while its unbalanced weight on that side would exert an upward pull on the drawbar of the cage, tending to hold the dogs out of action. On the occasion above mentioned, this is what actually happened, and while the springs were broken it is doubtful if they would have been able to overcome the weight of rope against them to put on the dogs even if they had been sound.

Compression Springs Better Than Torsion Springs

It was determined therefore that springs of a different type, less liable to hidden breaks and much more accessible, should be used, and that they should be powerful enough to overcome the unbalanced weight of the rope under any circumstances. It may be well to point out in this connection that in case of an overwinding accident, making a breakage which, however, left the cage attached to the rope, the unbalanced weight of the rope would be still greater and the necessity for strong springs on the dogs all the more urgent. Springs were therefore put on which, if necessary, could jointly exert a pull on the drawbar of about 1000 lb.

It was decided to use compression springs and to attach them to the dog shafts by means of arms securely clamped to the shaft. The construction is shown in the illustration.

Arrangement of Springs

There are two pair of arms on each shaft, which for convenience in attachment were made with their hubs split so that they could be put on the shaft without removing it from its place, and

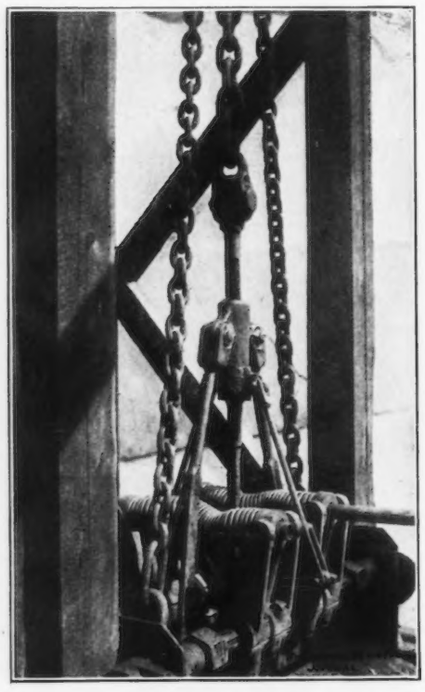


Fig. 1. Safety Dogs Operated by Compression Springs

also so that they could be gripped to it to assist in holding them to place. Each pair of arms carries, at its outer end, a trunnion piece which forms a spring abutment and has a hole through its center large enough to take a 1½-in. pipe.

The trunnions are turned to fit in bored holes in the ends of the arms, and the trunnion piece is prolonged into a sleeve about 6 in. long, the inside diameter of which is suitable for the pipe guide, while its outside diameter is a neat fit inside the spring, with a shoulder to retain the latter in place. The two shafts are compelled to move in unison by being similarly linked to the drawbar of the cage, and the arms therefore have an equal motion. The 1½-in. pipes passing through the trunnion pieces keep them always in line with one another and prevent the springs from getting out of line. The 1½-in. pipes are long enough for the maximum outward travel of the arms without having the trunnion pieces come in contact with the cotter keys, which hold the pipes in place. In practice it was found that while there was a keyway in the dog-shaft, keying of the arms was not necessary as the grip secured by the split hub was sufficient to hold them in place.

Springs of this kind are special and have to be made to order. They must have a great travel in proportion to their carrying capacity, and for that reason the diameter of the steel of which they are made must be small in proportion to the diameter of the coil and the length. Their dimensions for any given set of conditions can be taken from spring tables, or if the required conditions of carrying capacity and total movements are furnished the spring makers, with the approximate dimensions permissible for the location, they will figure out the spring required for the service.

Placing Springs in Position

It may not be amiss to say a word here as to the means of getting these springs into place after the apparatus is otherwise complete. A spring with a carrying capacity of 500 lb. when down, and a total compression of two feet, has stored in it 1000 foot-pounds when compressed. This would be nearly 2 h.p. for a second, but it takes one of these springs considerably less than a second to transform its potential energy into work, and considerably more than 2 h.p. of destructive effect can accordingly be realized if released. For a seemingly harmless piece of steel, one of these springs is about as dangerous, when in process of compression, as anything can be.

After the first spring had been applied, with much labor and danger, a simple rig was made to put them on, consisting of a bolt with about three feet of thread at one end and a piece of pipe big enough to slide over the 1½-in. pipe guide, about two feet long. The bolt was passed through the 1½-in. pipe guide with the trunnion piece in place at one end. The spring was then slipped over it, the other trunnion piece put in place and the pipe sleeve placed against the latter, with its end abutting against a washer under the nut on the long thread of the bolt. A similar nut and washer of course held the other end. The use of a wrench with this rig reduced the spring to the desired length. The trunnions were put through the holes in the ends of the arms, the arms clamped in place, and the bolt and sleeve removed to be used on the next. These springs work admirably. They have the power to put the dogs on solidly when the cage

is standing on its chairs, and still have a reserve of strength for use at higher levels if it should ever through accident, be required.

Accident Due to Overwinding

Just after the installation of these safety devices an overwind occurred in which one man was killed and much damage done to the headframe. It is obvious that there are still lessons to be learned, both from the original experience and from the wreck, which may benefit others and enable them to prevent similar accidents.

There was one feature of this accident, which in itself contained a lesson never to be forgotten. There was, at the property in question, a slope, as well as the shaft described above. At one of these the engineer threw forward his left hand and pulled back his right to put on the brake and shut the throttle. At the other (the engine being of a different make) these motions were exactly reversed, that is, the engineer drew back his left hand and threw forward his right to perform the same operations.

Result of Changing Engineers

The engineer at the slope, which was a less important operation, was extra engineer for the shaft when either of the regular engineers was absent. This man was hoisting when the trip was made which ended so disastrously. Two men got on the cage to come up, and gave the signal for hoisting men. The engineer brought the cage practically to a stop at the ground level, and one of the men stepped off; the other was not quite so quick and before he could leave the cage, it started off again at a terrific speed, was hoisted 75 ft. to the top of the headframe and struck on the cross timbers supporting the sheaves. The rope was stripped through the socket, and the cage fell 450 ft. to the bottom of the shaft.

It was impossible to find out from the engineer exactly what he had done, as investigation showed that he was of a nervous temperament. The strong probability is that when he had brought the cage to the surface he intended to close the throttle and put on the brake, and made the movements which he had been accustomed to use during all his experience as a hoisting engineer. The motions had become practically automatic, as they should in such cases. But unfortunately he was not at his regular post and the motions which he made took off the brake and opened the throttle wide. The obvious lesson from this experience is that a hoisting engineer should not be transferred from one engine to another, unless the motions required for stopping and starting are identical in the two posts.

Improved Safety Dogs

It is quite obvious that the improved safety dogs would be a means of holding the cage even if it were stripped from the rope by an overwinding accident, and this idea was certainly in mind when they were designed. As a matter of fact, however, the first part of the cage to strike the cross timbers of the headframe were these upward projecting arms with their springs and guides, so that they were broken before the cage was stripped from the rope, and were therefore useless to prevent its descent.

Profiting by this lesson, a pair of detaching hooks, with their detaching bell, was obtained from the Wellman-Seaver-Morgan Company. The hook and its attachment to the chain at the top of the sheave, as well as to the safety chains, are shown in the illustration.

The pin of the clevis in the top is held in a hole, of which there is a little more than half in each of the two plates which compose the hooks, with a slot opening out through the top of the plates. But in the position shown these slots do not come opposite, solid metal in one plate being opposite the slot in the other, thus holding the clevis pin securely.

Bell for Detaching Block

A bell is fastened to the headframe, through which the head of the detaching hook can pass without touching, but the fan-shaped lower ends are caught by the sides of the bell and forced together like the blades of a pair of open shears, the two plates being pivoted together on the heavy pin in the center. This movement shears the copper rivet which holds them in position, and throws the slots at the top of the plate opposite one another, which allows the clevis pin to pass out freely, thus detaching the rope from the cage entirely.

The bell is simply a casting consisting of a frustum of a cone with external flanges at top and bottom. The small diameter of the cone is just sufficient to permit the passage of the round head of the detaching hook, while any further rise results in forcing the fantail of the hook against the sides of the cone, as described above. A sharp shoulder will be seen on the front plate of the hook, on the right of and nearly level with the pin of the clevis. There is a similar shoulder or hook on the rear plate. The wedging together of the fantail in the cone forces these hooks out; at the same time the slot is opened for the passage of the clevis pin out of the top of the hook. After this action, of course, the cage tends to fall, but these shoulders catch on the top edge of the bell and hold it there in safety.

In order to sustain the weight of the cage and to meet the shock of a rapid overwinding, the bell must be securely fastened as well as exactly in the center of the guides. A substantial support in this position is not easy to construct, the corner posts being the only substantial members of the frame. A truss was worked in, which ran from corner post to corner

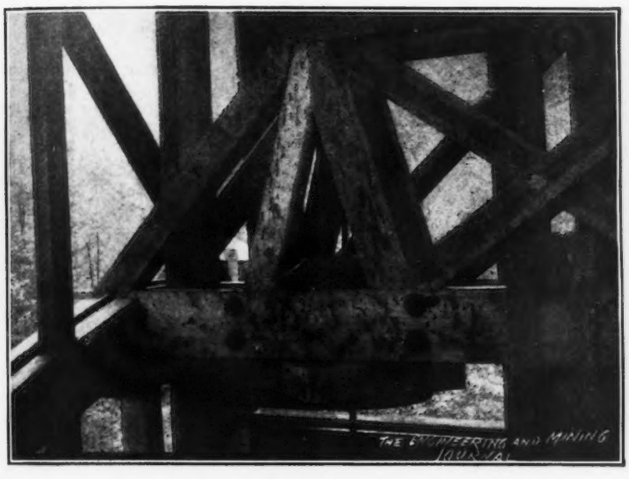


Fig. 2. Bell at Top of Headframe to Receive Detaching Blocks

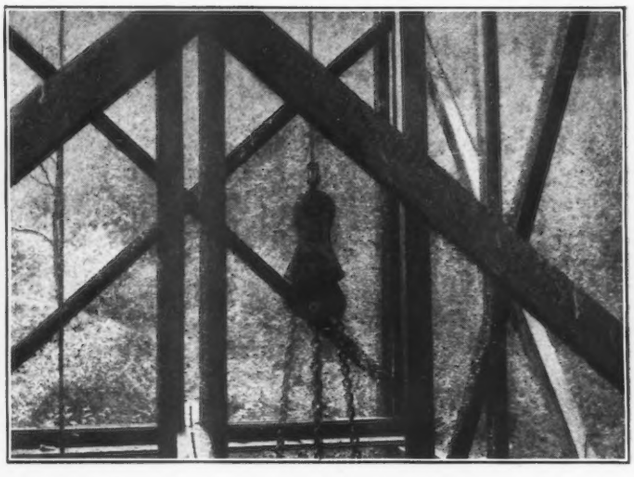


Fig. 3. Detaching Block to Prevent Overwinding Accidents

post, and from the apex of this truss a cross truss was inserted, so that the bell was securely held and sufficient strength provided.

Safety Chains

It may be worth while to call attention to the method of attaching the safety chains to the detaching hook. In the original construction the safety chains ran to a heavy cast-iron clamp which gripped the rope a short distance above the socket. From the position of this clamp, and my experience with the breaking of the ropes at the top of the sockets, I am inclined to believe that these safety chains were put on to provide against an unexpected breakage of the rope at this point. They became useless when we adopted a construction which did away with these breakages. The safety chains could not run to the clamp above the socket after the detaching hooks were installed, as they would serve to overwind the cage after the detaching hooks had operated. It was, therefore, necessary to attach them below the detaching hook, as shown in Fig. 2. It would have been possible to abolish the safety chains altogether, but I never feel like removing a safety device which anyone else has found useful, and accordingly the construction was modified to permit the continued use of these safety chains.

The records of failures and the means taken to prevent their recurrence are interesting and valuable to operators, and this experience is offered in the hope it may fall into this class rather than with any idea of its containing anything of profound novelty.

Electric Furnaces at Domnarvet

It is stated that the experimental electric furnace at Domnarvet, Sweden, is to be torn down and new ones installed. According to *Engineering*, it is purposed to build 10 electric steel furnaces, each of which will require 4000 h.p., while the new one at Trollhätten falls will require only 2500 h.p. The Bullerfors power station, now supplying current for the experimental work, can only yield 24,000 h.p., so an additional power station at Torshufond will be built.

Tin Mining near El Paso

By Walter E. Koch*

The mines, mill and smeltery of the El Paso Tin Mining and Smelting Company are situated on the eastern slopes of the Mt. Franklin range about 10 miles due north of El Paso, Tex., and are reached by an automobile road, 16 miles long. The elevation is about 1000 ft. above that city.

Geology

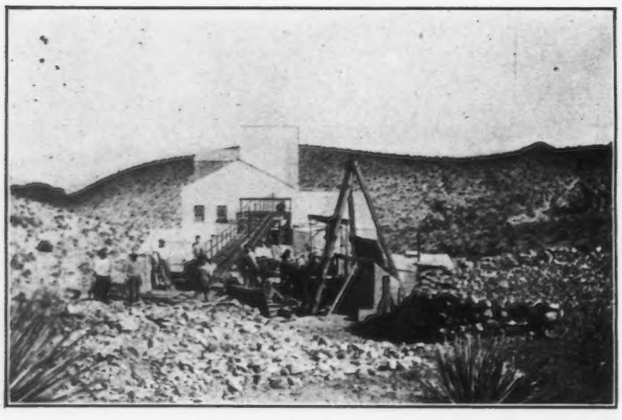
The geological formation is granite overlaid by pre-Cambrian, Cambrian and Ordovician quartzites, shales, and limestones. The tin orebodies are found in the granite. They consist of veins, stockworks, and zones of impregnation. The veins are quartz, and serve chiefly as indicators but also carry ore. The ore is cassiterite, and occurs both in the veins and in impregnated granite on both sides of the veins. The granite is composed of quartz, orthoclase and mica, and the cassiterite appears to replace the mica, giving rise to the local name of "cassigranite;" it is usually pink in color and weathers to a rusty brown making it hard to distinguish from the surrounding rock.

There are seven parallel veins under development, all trending east and west with a slight dip to the north. The company owns 3500 acres so there is ample ground for further development.

The following minerals are found: Quartz, orthoclase and plagioclase feldspars, white and black micas, pyrite, pyrrhotite, hematite, limonite, magnetite, fluorite, tourmaline, topaz, hornblende, augite and wolframite. The augite occurs in a diabase dike that passes through the granite mass from north to south. There are also numerous veins of pegmatite, and aplite. From No. 1 vein to No. 7 vein is 4100 ft. in a straight line from north to south; their length from east to west is at present unknown, being concealed to the east under wash, and to the west by the Cambrian rocks. The granite is considered to be post-Carboniferous.

Experimental Mill

The mill and smeltery were essential in the development of the property, because, as every tin miner knows, it is difficult to sample and assay a tin prospect. Large samples of 10 to 20 tons are needed and there is no mill in the Southwest suited to the treatment of tin ores. A 50-ton mill and a small smeltery were built. Water is rather scarce, and as tin ore is especially apt to slime, Sutton & Steele dry tables are used. The mill was designed by R. C. Canby and consists of crusher, rolls, trommel, "vibracone" screens, wet fine jigs, dryer, Keedy sizer, and dry tables. At present all the ore is reduced to 14 mesh, and the sizes from 14 to about 30 mesh go to the jigs; the finer sizes go to the Keedy sizer and on to the tables; while the jig middlings are dried, ground, and then go to the Keedy sizer and tables. The jigs thus eliminate most of the gangue. The concentrate assays about 60 per cent. tin, and goes to the smeltery, and refining pot; but the tin is so pure that it scarcely needs refining, as the ores are free from arsenic, copper and other impurities, except a little iron which is easily kept out. A 60-h.p. Hornsby-Akroyd crude-oil engine supplies the power. The furnace is a small oil-fired reverberatory. No fluxes are used; the concentrate is mixed with 12 per cent. of New Mexico anthracite and the quantity of tin lost in smelting is small. The tin is run into 100-lb. ingots, and three tons were shipped last month to Philadelphia. The company is a close corporation, of which S. H. Chauvenet, of Sheridan, Penn., is the president and general manager.



Mill and Santiago Shaft, and Reverberatory Furnace of the El Paso Tin Mining and Smelting Company on Franklin Mountain, Texas

*Consulting engineer, 527 Guaranty Trust building, El Paso, Tex.

New Slime Filter at El Oro, Mex.

By Edwin Burt *

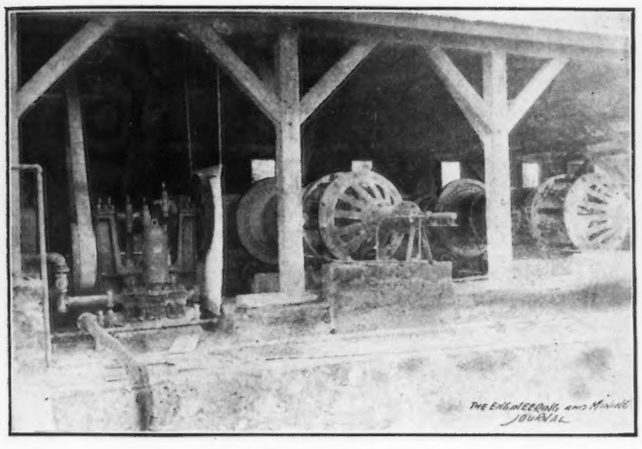
A horizontal tubular filter operating under pressure from gravity. Six units have been installed at El Oro mill, filtering 1000 tons of slime per day at a cost of about four cents per ton.

*Consulting engineer, 303 Caple building, El Paso, Tex.

The hard quartz ore, which is treated at El Oro mill in Mexico, is crushed by stamps and reground in tube mills to slime, of which 83 per cent. will pass a 200-mesh screen. Of the ground ore 38 per cent. is colloidal matter and 62 per cent. sand. Decantation and mechanical agitation are used in the cyanide plant for the treatment of the slime, after which it is pumped to two filter supply tanks, each, 34 ft. in diameter by 20 ft. deep, equipped with an overflow launder and slow-speed agitator, that deliver pulp averaging 38 per cent. moisture to the filters.

Filter Plant Handling 1000 Tons

The filter plant consists of six Burt revolving pressure filters, one 275-gal. solution pump, one solution tank 10x20x5 ft. deep, one small acid tank and one 40-h.p. electric motor. The motor, placed over the filters, drives a countershaft from which each filter and the pump is driven by belt, friction clutch, spur and bevel gear. Before going into the description of the plant it will be well to state that at the time the six filters were installed, the mill tonnage was from 750 to 800 tons per 24 hours, but since then the tonnage has been increased gradually to 1000 tons per 24 hours. Although the filters are handling this tonnage, it is overcrowding them a little and three more filters are being installed, which will give more time for the filtering and washing of the slime.



Burt Horizontal Revolving Pressure Filters at El Oro Mill, Mexico

Construction of the Filter Press

Each filter consists of a cylinder 42 in. in diameter by 40 ft. long, set in a horizontal position. The head end is closed by a large casting bolted to the flanges of the shell. At the discharge end there is a door, made of a cast-iron ribbed plate, covering the entire area of the opening of the cylinder, which is opened and closed by a hydraulic cylinder and piston operating six heavy toggles and levers, so adjusted that they exert a great pressure against the door when it is closed. The joint between the door and flange is made with a ⅝-in. square, soft-rubber gasket, placed in a square slot in the flange of the door. An oval ring on the door proper presses against the packing and makes a perfectly tight joint. Water under 125-lb. pressure operates the doors and is controlled by one ¾-in. four-way valve. The filters have trunnion bearings at the head end and roller bearings 10 ft. back from the discharge end, and revolve 15 times per minute. The foundations are of concrete with cement floor under the filters. The floor is given a slight fall to a point under each filter where a hole, covered by a screen, connects with an underground channel that conveys the filtered solution to the solution tank at one side and a few feet lower than the level of the filters.

Arrangement of Filter Cloths

The inside of the filter is lined with 20 filter cloths, each 26 in. wide by 10 ft. long, allowing five in the circle and four to the length, held in place by curved 1½-in. angle irons, which are staggered throughout the interior and fastened to studs in the shell at the junction of two cloths, in such a position and pitch that they act as a spiral for discharging the slime cake after it has been filtered. The cloths are made of two sheets of canvas, or filter cloth, sewed together at 8-in. intervals, between which are inserted wooden corrugated boards 1 in. by 7½ in. by 4 ft. 8 in. long. The boards are cut to such length that a break is made in the center line of the cloth at which point a 1-in. nipple and iron screen are inserted for the discharge of the filtered solution. The nipple is made long enough to extend through the filter shell and on the outside a lock nut is placed to aid in holding the cloth tight against the shell. To prevent a leak at the point where the nipple passes through the shell, a 1-in. washer of hair felt is used. Each cloth is a filtering unit by itself and can be plugged on the outside if the effluent becomes cloudy.

In the manipulation of the filters, quick-opening valves are used, there being a set at the head of each filter, the connections being made to the pipe that passes through the hollow trunnion. The set of valves consists of one 4-in. slime feed, one 2-in. wash solution, one 2-in. wash water, one ¾-in. compressed air and one 3-in. escape valve for reducing the pressure in the filters when desired.

There is also a set of valves so connected that, by leaving open all the valves at the head of the filters, the six filters can be operated as one unit, but it was found in practice that this resulted in a great loss of time, because one or two filters would finish quicker than the others, thus delaying operations until the last filter had finished. A greater capacity was obtained from the plant by operating each filter individually. A wooden clock dial with a pointer is placed at the head of each filter by which the operator keeps track of the cycle.

Operation

The operation is as follows: The filters revolve continuously. The doors being closed the valve man opens the slime-feed valve for three minutes, when the proper charge of slime pulp has been admitted (it being under a gravity head of 60 ft.); the pressure-gage now shows about 35 lb. pressure made by the inrushing slime compressing its imprisoned air in the filter. The slime-feed valve is closed and the air valve opened to raise the pressure to 40 lb., at which point it is maintained until all the solids in the pulp go to cake and the moisture has been reduced to about 20 per cent., which is signified by air blowing out of some of the solution nipples. Then the air valve is closed and, if the wash solution or wash water is under sufficient head to overcome the pressure in the filter, it is allowed to enter at once, but if not, the escape valve is opened and the pressure reduced enough so the wash solution will enter. The required amount of wash solution is admitted (the amount having been determined by previous experiment), then the solution valve is closed and more air admitted to maintain a pressure of 45 lb. to force the solution through the cake. When the wash solution is through, it is followed by wash waters in the same way, the pressure being dropped to zero. The head man then signals the door man to open the door of that particular filter.

COST PER TON OF SLIME FILTERED.

	Nov. 1909 to April 1910.	March and April 1910.
Wages of tenders and proportion of shift-bosses and superintendent	$0.016	$0.0135
Wages account, repairs and renewals	0.0045	0.003
Supplies	0.0165	0.0105
Electric power	0.0065	0.006
Compressed air	0.004	0.0045
Hydraulic power (water for door)	0.0015	0.001
Light	0.0005	0.0005
Total	$0.0495	$0.039
Tons slime filtered per month	26,135	28,036

Removal of the Cake

After the door has been opened for about one-half minute, the heavy cake falls and rolls into a large loaf when the head operator admits a small amount of water at the head end, just enough to make the filter cloth slippery, which causes the filter to turn under the loaf of slime, causing it, with the help of the angle irons to slide toward the door and out where it falls into the discharge pit. The moisture in the discharge cake, including water added, is 25 per cent.

The filters are set exactly horizontal so it is simply the slippery filter cloth and angle irons that cause it to discharge. After the discharging is finished, which takes three or four minutes, the door is shut and another cycle commenced. The clear filtered solution which commences to come out of the discharge nipples immediately the slime is admitted, falls to the cement floor from where it flows to the cement channel underneath and out to the solution tank to be pumped back to the cyanide plant.

Removal of Lime Salts

An acid bath given once a month is quite sufficient to remove lime because, owing to the short time in which the cloths are exposed to the air they do not stop up with lime quickly. To give the acid treatment it is not necessary to remove the cloths from the filter. After cleaning the cloths of all loose slime by revolving the filter half filled with clear water, the acid solution is admitted, the filter revolved for half an hour when the air pressure is raised, which forces the acid solution through the cloths thoroughly cleaning the pores of all lime. It takes 2½ hours to acid treat cloths of six filters.

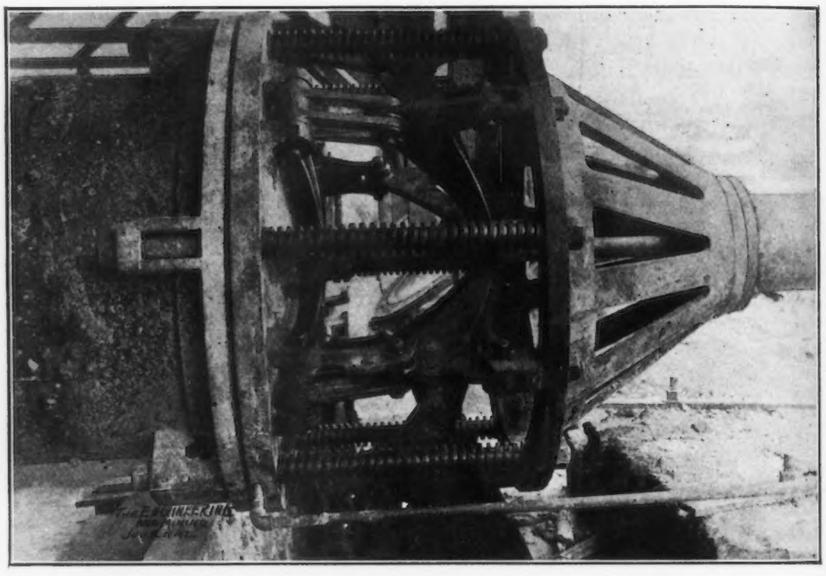
Data of Operations

The life of the filter cloths is about four months and costs less than 0.4c. for renewals per ton of slime treated. There are 2400 sq.ft. of filtering area in the six filters which, figured on the capacity of 27,000 tons of slime per month, equals 11¼ tons filtered per square foot of filter cloth per month. The cycle of operation is as follows: Charging slime, 3 min.; making cake (40-lb. pressure) 23; charging wash solution or water, 3; washing (45-lb. pressure), 30; discharging and closing door, 3; total time, 62 min.

The cycle varies from 50 to 70 min. depending on the thickness of the pulp going to the filters; slime treated per filter per cycle, 7 tons; average thickness of cake 6 to 7 inches.

The above data are taken from the operations during the month of April, 1810, when the total tonnage filtered was 28,546. The men employed to operate the plant are: Three Mexicans (8-hr. shift) for operating the quick-opening valves at $1; 2 Mexicans, (12-hr. shift) for opening doors, at 50c.; 1 mechanic for mechanical work and cloths at $1.50; 2 Mexicans (12-hr. shift) oilers at 0.37½c.; total $6.25. Old cloths are repaired and new ones made by one man who does the work in connection with running the cyanide-solution pumps. He uses a heavy sewing machine to do the work and can rip apart and sew a filter cloth in about 30 minutes.

Although the filters are made to stand a maximum working pressure up to 70 lb., it has been found in practice that if the cake is made at 40 lb. and washed at 45 lb. it is the most efficient and economical pressure to use. The consumption of air is 24 cu.ft. of free air per minute compressed to 45 lb. The horsepower consumed by the plant is 30 per day. The average horsepower required for five filters and countershaft in continuous operation and a 275-gal. triplex pump running intermittently over a period of four days' test was 24.8. Average load taken by six filters, 23.7 h.p.; average load taken by one filter, 3.7 h.p.; average load taken by pump, 4.3 h.p.; highest peak load of one filter when discharging over a period of one minute, 20.8 horse power.



Discharge End of Burt Slime Filter

A discovery of molybdenite is reported to have been made on the farm of James Warren, Bagot township, six miles from Renfrew, Ontario. J. J. Cawich has secured an option on the mineral rights.

Utilization of Colorado Minerals

By Franklin Guiterman *

As mining and metallurgical methods are perfected, raw materials formerly regarded as waste may be profitably utilized. Material taken from Leadville mines and sent to waste dumps without analysis has only recently been found to be valuable zinc ore. Treatment of Cripple Creek waste dumps has demonstrated that a small profit may be realized when the amount of gold exceeds $3 per ton.

NOTE—Excerpts from a paper entitled, "The Use, Nonuse and Waste of the Mineral Resources of Colorado," read before the Colorado Scientific Society.

*General manager in Colorado for the American Smelting and Refining Company, Denver, Colo.

In presenting this important subject it is not the purpose to cover the whole ground, but rather to limit the discussion to the consideration of the extent of utilization and waste of the metalliferous mineral supplies of the State. Other mineral resources in which the State abounds, such as coals, clays, marbles and oils, can be left for review at some future time. At present, however, it seems appropriate to consider the development of those industries which have for their object the utilization of the metalliferous minerals alone and to point out wherein, in the opinion of the writer, the limit of efficiency seems to have been reached on the one hand, and where there is still room for technical improvement and extent of utilization on the other.

The term "limit of efficiency" in industrial work is a comparative one and simply signifies that under certain conditions of operating costs and commercial values for the products made, further utilization of raw products of lower or inferior grade cannot be effected advantageously, or, that on account of higher productive costs and a subsequent financial outcome, it may not be advisable to carry the process to a higher degree of technical perfection, even if this be possible. It therefore follows that before a commercial use can be made of raw materials or products which under certain conditions were nonserviceable previously, or before products can be utilized which under certain conditions had been discarded in the process of manufacture as valueless, improvements must be made in the processes themselves by which additional economies can be brought about or a better technical outcome attained at the same previous operating costs; or finally, that an industrial use must be found for a product for which before there was no demand.

CONDITIONS OF PRODUCTION

Upon examination of the conditions surrounding the ore production from metalliferous mines, the subject divides itself into two considerations:

(a) Production of ores fit to be consigned at once to the smelting points.

(b) Production of ores which have a preliminary concentration treatment before the product is enriched enough for smelting treatment.

In the ordinary conduct of metalliferous mining exact control of operations from an economical point of view, especially in the working of the smaller properties, is difficult to secure. Not that the art of mining can be classed as an intricate one, but that most of these properties are characterized by limited ore production, relatively speaking, and their conditions of mineral output are apt to change more or less radically within comparatively short periods of time. The oreshoots may widen or narrow, or pinch out entirely, and concurrently the grade of the ore may vary up or down, gradually or suddenly. Therefore, unless the orebodies which are to be exploited are large, such as was and is the case at Leadville, Aspen and Creede, the best operating results, both as to costs and savings, may fall short of being attained.

The capable mine manager ought, not only on the larger properties, but no less on the smaller ones, to be one of technical and practical skill, who should be far-seeing enough to be prepared for the unexpected within a reasonable degree of variation. Above all things, to realize the best results, he should be fully informed as to the character and value of his orebodies, a knowledge which can only come through painstaking, thorough, honest and continuous sampling of the orebodies exposed in the mine, and of the products to be sent to the smelter. If this be not done the result is likely to be a mixing of worthless material with good ore, involving not only a lowering of the value of the ore with an attendant increase of costs, since freight and smelting charges are applied on the whole mixture, or through lack of proper information a waste of good ore may result in that it is left in the mine when there might be a profitable market for the same.

It is the rule, and a proper one, that when a mine fails to pay under company management the interests of the company can be best served by leasing the mine to other parties on a royalty basis. The plan is excellent provided the lessees' work be carried on under supervision of the company's representative, and that in conjunction with the exploitation of certain areas, or zones, new development work be carried on. Unless such provision be made the outcome is almost sure to be unfavorable to the mining company.

As a rule, however, it may be said that in extracting his ore the lessee works more economically and wastes less than is the case when the mine is worked under company management, reference being had particularly to the mining of smaller and richer orebodies. The reason is not far to seek. The lessee not only works harder for himself than he will for the company, but he is also more careful in mining the ore to see: (1) That he does not waste it, and (2) that no material which will not pay for smelting charges be mixed with the ore.

The failure to have careful, continuous and complete assays made on ores of the mine may sometimes keep the management in ignorance of very important knowledge, which if not at the time of material value, may become so at a later period.

THE ZINC ORES OF LEADVILLE

As a striking example of the value of thorough knowledge of the ores of a mine the writer desires to call attention to the recent discovery of zinc carbonates and silicates in some of the prominent Leadville mines.

I have it on the authority of Henry Head, assistant cashier of the American Smelting and Refining Company, at Denver, that the presence of this material was known about 30 years ago, when a shipment of the ore was made to one of the smelters at Leadville. Mr. Head was at that time managing a sampling works at that point. This zinc ore, from the Morning Star mine, was a carbonate and was shipped through Mr. Head's works to the Gage-Hagerman Smelting Works. Complaint followed the receipt of the ore at the smelter on account of the high zinc content, which made the ore undesirable for lead blast-furnace smelting. As far as Mr. Head remembers that was the last of the incident. The smelting company went out of existence and the mine management changed hands, and in due course of time was passed over to lessees.

The recognition of such zinc orebodies was only made recently in Leadville, when W. H. Krespell, an ore buyer, was there and happened to inspect the dump of the Hayden shaft, belonging to the

May Queen mine, on Yankee hill. He observed mixed with the dump material certain mineral portions which he at once identified as zinc carbonate and silicate, from their close resemblance to similar ores which he had seen in old Mexico. This discovery was imparted to Samuel D. Nicholson, president and general manager of the Western Mining Company, who on inspection of the ore dump recalled the presence of similar masses in the Morning Star, Maid of Erin, and other prominent Leadville mines, and thus in the case of the Morning Star led to the rediscovery of the material, some of which had been shipped 30 years before, and whose true character was then known. From information which is now at hand the recognition of these zinc-carbonate and silicate orebodies promises to be of highest economic importance to the Leadville mines.

Calamine Was Thought to be Carbonate of Zinc

That these now valuable ores should have been overlooked is not altogether strange. In appearance the zinc carbonate resembles on the whole an inferior grade of oxidized iron ore so abundant in Leadville. As the assays on these zinc-carbonate ores were made only for iron and silver to determine their value as possible fluxing material for the lead smelters, the disappointing results obtained led to their rejection as ores of commercial utility. The only circumstance which should have aroused the suspicion of the mining operators of the camp was the common occurrence of crystallized and crystalline masses of almost pure silicates (calamine) in the general ore mass, and it seems to me that they should not have been passed by as lime carbonates, for which it was said they were mistaken, without confirmatory evidence having been furnished by analysis. However, in this case the recognition of the true character of the ore has come at a most opportune time, for never has there been a higher commercial value attached to this character of mineral than there is at the present time. The lesson, however, of the imperative need of a thorough knowledge of the mineralogical character of the orebodies of a mine, regardless of gold, silver, lead and copper contents, cannot be ignored.

The Design of Reduction Works

This knowledge is all the more important when dealing with that class of ores which demands concentration previous to shipment to the smelting works. It is not alone enough to know the metallic contents of ore to be concentrated, but the mineralogical character of the mass should be thoroughly understood. The work of ore concentration is one of the most difficult of mechanical arts, although regrettable to state, it is commonly held by mine operators to be the very reverse. The utter failure of many ore-concentration projects, and the lamentable waste of money and ore in carrying out the work, may justly be referred to a want of proper knowledge of the ore and best operating methods. An altogether too frequent procedure in Colorado is the following:

Assume it is decided to erect a concentrating mill. Bids are called for from various mining- and milling-machinery houses who supply ore concentrating equipment. In the intent of supposed economy, the machinery firms are asked to furnish a mill design, which they gladly do. The order for the machinery is given and the mill erected. The mining begins without coördination and coöperation between mine and the mill superintendents. The mine superintendent desires to make a record for cheap mining and so proceeds to knock down the ore regardless of waste rock. The grade of ore is consequently lowered and the mill is called upon not only to wash out this waste, but also the gangue which is legitimately associated with the mineral. The result is a great mineral loss in the mill in the endeavor to get clean concentrates.

Perhaps the design of the mill may not have been at all adapted to the proper working of the ore on account of a wrong idea of the mineral character of the product in the mind of the mill designer. The result of this wrong conception is a still more disastrous outcome for the mine.

About this time, either on account of the lower grade of the ore through an unnecessary waste admixture, or because of the unadaptability of the mill design to the ore itself, changes in the construction of the mill are inaugurated by the officials in charge who rearrange the equipment or add new devices, according to their own ideas. The final outcome is usually a disheartening failure of the enterprise.

Metallurgical Treatment of Cripple Creek Ores

All ores produced in Colorado are finally treated either at reduction mills or at smelting plants. The former limit themselves to the exclusive working up of Cripple Creek gold ores, or similar ore products, while the latter treat all classes with the exception of high-content zinc ores, for which there is a separate plant.

In the reduction mills the metallurgical process is either the extraction of the gold by cyanide solution, or by conversion of the gold into chloride. Both of these processes have been developed to a high degree of technical perfection, and the rates of treatment by the public reduction mills have been so lowered that gold ores of a gross value of $10 per ton can today be mined and marketed with profit to the producer. In fact, it has recently been stated by Philip Argall that Cripple Creek gold ores of a gross value of $3 per ton can be successfully treated by the cyanide method at a small margin of profit. This statement is based, however, on the treatment of ores on the dump where they had been placed at a time when the richer ores were mined, and to which the combined mining cost was charged. It is therefore not to be understood that ores of $3 gross value per ton can be mined and treated with the cyanide process with the expectation of realizing a profit. Neither can such ores be subjected to a preliminary roasting treatment with the involved extra expense. It has been demonstrated, however, that an oxidized gold ore already mined and ready for delivery to the mill, such a one being of $3 gross value per ton, the gold being figured at $20 per ounce, can be cyanided and the gold extracted at a small profit. Therefore, while the treatment of such ores, even if on the dump, does not offer very attractive inducements for a milling enterprise, nevertheless if such tonnages be handled in conjunction with richer ores, they would play the important role of a reducer of milling costs in general on account of the increase of tonnage handled in the mill with the same overhead charges, and would thus serve a most useful purpose.

It has also been found in the Cripple Creek district, where ores were milled and the tailings carrying from $1 to $1.25 in gold per ton were impounded, that through the oxidizing action of atmospheric agencies such tailings became later on readily subject to the solvent action of cyanide solution and fully 70 per cent. at minimum of the contained gold could be profitably recovered at a low cost. It may be stated, therefore, that the waste or nonutility of Cripple Creek gold ores involves only such of less than $10 per ton gross value in the mine, the exact limit of utility depending on the mining cost, and of $3 per ton for ores on the dump.

Smelting Ores

In the matter of smelting ores, those of simple as well as of more complex nature, the problem becomes somewhat more intricate, for it is not alone a question of the value of the recoverable metals in the ores themselves, but the quantity in which the ores can be used often acts as a limit to their use or nonuse in whole or in part. In successful smelting the first requisite is a charge of fixed chemical composition, and this necessarily limits the quantity of certain ores which can be utilized if others which are also demanded for the smelting charge be lacking. Thus, a smelter will be limited in his use of irony ores if silicious ores be lacking, or in both, if lead or copper ores be wanting. The aim of the smelting plants therefore is to encourage

the production of all classes of smelting ores to the highest degree, and to provide against temporary shortage of certain classes by taking care of a surplus production by storing the products for which there may be no immediate need.

Colorado has never been a mineral field which has permitted smelting on a large scale except that in lead blast furnaces. It has in bygone years been a great producer of silver, gold, lead, silicious, irony and limey ores, but has been lacking in those tremendous tonnages of copper-bearing ores which have permitted the development of the existing copper-smelting operations of Montana, Nevada, Utah and Arizona.

Losses in Smelting

In respect to the metal losses or waste obtaining in the smelting operations, they divide themselves into two classes, viz., chemical and mechanical, and both of these are at times so closely associated that the means taken to prevent the one will at the same time cover the other. For instance, in blast- as well as reverberatory-furnace work, there is a fume, that is, volatilized metal or metallic compound, loss, which may be termed chemical, and a dust loss which is entirely mechanical. Fume may be condensed in chambers by frictional contact and a lowering of temperature of the gases, while dust, no matter how fine, may be settled in the same chambers by frictional contact with the flue walls or plates, and a diminution of velocity of travel. Or, both fume and dust may absolutely be recovered by passing them through a filtering medium.

On the other hand, both mechanical and chemical metal losses may be sustained in the slags resulting from the smelting work, which are discarded over the dumps. These slags may contain metals, such as copper and lead in chemical combination and which, therefore, make for chemical losses, or they may contain metals and metallic compounds in the shape of prills and larger masses which would represent a purely mechanical loss. If such slags be allowed to settle in a quiet state while still liquid, the metallic portions can be separated out and recovered.

It may be said that in the main the improvements in smelting works during the last 30 years have been in the direction of the application of mechanical means to reduce losses and cheapen costs. To accomplish the former it is the aim to prepare the ore when in an unsuitable condition, that is, when it is too fine for blast-furnace work, by bricking and other mechanical means, in order to reduce dust losses; by attaching a system of settling flues to the blast furnaces; and by introducing filtering devices for blast-furnace gases, even when these may have traveled previously through a settling-flue system.

In the treatment of the slags issuing from the furnaces, settlers are used either with or without the application of external heat aid. The extent to which it may be advisable to go in the introduction of such devices, which have for their object the reduction of metal losses, depends entirely on the financial outcome which may attend the saving. It is easily possible to carry the recovery to such an extent that a financial loss, instead of a profit, in the recovered metals will result.

In every modern smelting plant the equipment now is such that it may be said the metal loss has been brought to an irreducible minimum, and it is these conditions which have made it possible to treat to a liberal extent with profit to the ore producer in Colorado iron sulphides, and silicious, dry, lead or copper ores of $10 gross value per ton and even less.

In the smelting of these ores there are certain contents which cannot be utilized to advantage; thus, the sulphur in the sulphide ores. Some of the ores of Colorado also contain arsenic, which is condensed with the fume deposited in the settling flues. It is readily possible to retreat this fume and concentrate the arsenic to such an extent that it may finally be treated for the production of arsenious acid, or "arsenic white" as it is called. Such arsenic finds an extended use in the manufacture of plate glass and as an insecticide. Not so long ago the price of this material was such as to permit the manufacture of arsenic white derived from by-products such as have been mentioned, with profit. The excess of production, however, over demand is at present so large that the price has fallen to a point where there is no longer any profit in the manufacture. Non-utilization of this article cannot, therefore, be termed a waste.

Losses of Zinc

Associated with sulphide lead and copper in Colorado ores there is nearly always present zinc blende. Ores that carry less than 20 per cent. zinc cannot as a rule, in the present state of the art, be treated at profit for the production of zinc, even if they be previously subjected to a magnetic-separation process. Therefore, in order to extract their associated gold, silver, lead and copper values, these ores are smelted in lead or copper blast furnaces or in reverberatories. Here, however, the zinc is thrown into the slag with other slag-forming compounds. Not only is it lost itself, but it may occasion other severe metal losses if it be permitted to be present beyond certain limits. Thus, in the roasting process it conduces greatly to the loss of silver, as the volatilization of silver is greatly facilitated by its association with other volatile metallic compounds, such as zinc, antimony and arsenic, in the presence of air. Again, in blast-furnace operations zinc volatilizes as metallic zinc only to recondense in a measure in the upper regions of the stack, thus occasioning accretions which promote irregularity in the furnace work with attendant loss of control and incidental failure to do good metallurgical work. Finally, with the passing of zinc oxide into the slag a marked difference in its physical characteristics takes place. Both zinc oxide and silicate are practically infusible. Hence these compounds raise the fusion point of the slag, or at the usual temperatures of lead blast-furnace work render the slag viscous so that the metals or metallic compounds which it is intended to save, do not separate from the slag as perfectly as they should, and the mechanical loss largely increases. The loss of such zinc itself is not at all a waste, but occasions one.

Zinc Concentration and Smelting

When the percentage of zinc in ores rises so high that these mineral products may be treated either by magnetic separation or at once in zinc furnaces for the production of spelter, such ores become a source of profit to the producer.

The practice in Colorado in the treatment of zinc ores, both as to magnetic separation as well as furnace work, compares fairly well with the best practice elsewhere, both in the United States and in Europe.

It may not be out of place to cite an exceptional example of this kind: At Leadville, one of the mines for lack of dump room was obliged to erect cribbing for the retention of its mill tailings in order to prevent them from flowing on to neighboring territory and into a small stream. The original ore on which the mill worked was a compound of galena, pyrite and blende, with a small amount of gangue. The mill process was really a separation one by wet method of the galena and pyrite on the one hand from the blende on the other. This last product carried about: Gold, 0.04 oz. per ton; silver, 6 to 7 oz. per ton; zinc, 26 to 27 per cent.; lead, 6 to 7 per cent.; iron, about 20 per cent.; silica, about 8 per cent.

Had the blende remained in the ore it would have occasioned penalty charges in the smelter treatment. For over 20 years retained behind the cribbing it remained worthless, but with the perfection and advent of the magnetic-separation process a wonderful change took place. There were something over 80,000 tons of the material in the dump and these netted the owners, who had so many years before been obliged to resort to unwilling conservation, over $325,000; and today there are at Leadville, as well as in other Colorado mining districts, mines which owe their continued existence and prosperity to that once formerly despised zinc mineral.

Graphic Calculations of Development Work Costs—I

By Claude T. Rice

There are so many ways in which graphic calculations of development-work costs can be made with all the accuracy desired that it is a wonder that such methods are not in more general use. Graphic methods of making calculations in regard to the cost of labor in driving all forms of linear work, such as drifts, raises and shafts, either by day's pay or contract are entirely satisfactory. However, the first use of such methods for this purpose has, as far as I know, been made by Ivan de Lashmutt, engineer at the Highland Boy mine, Bingham, Utah.

Curves for Contract Work Are Straight Lines

For plotting contract work the equation $n\,y = m\,x$, where y is the wage earned each day by the men, x the number of feet advanced in a week, n the number of man-shifts worked in a week, and m a constant representing the price paid per foot. As the equation is of the first degree it is represented by a straight line, and as, when $x = 0$, also $y = 0$, all the curves have 0-0 as their origin.

A vertical scale of one inch to one dollar and a horizontal one of one inch to 10 ft. of advance is ample for representing the cost of development work. A convenient book in which to plot such contract curves is a Keuffel & Esser No. 376 cross-section book. In any event a 10-scale paper should be used on which to plot the curves. In figuring on the cost of contract work it must be remembered that there are two classes of such work, namely, one in which the men are paid just what they earn, and another, in which the men are paid so much per foot of advance and guaranteed, whether they earn it or not, the wage prevailing in the district for that kind of work.

Contract Diagrams Useful under Any Wage Conditions

The four straight contract diagrams illustrated in Figs. 1, 2, 3 and 4, are plotted according to the equation given above. They can be used in any camp, no matter what the wages paid. The diagrams are most easily calculated by dividing the product of the rate per foot and the distance driven in a week ($m\,x$) by the number of shifts worked in a week (n), and plotting the quotient against the wages earned per man when 60 ft. per week are driven, the rate per foot being small. Or when the rate is higher, by calculating the distance that the crew would have to drive to make the highest wage shown on the diagram, in this case $7 per day. The several inclined lines on the diagram rep-

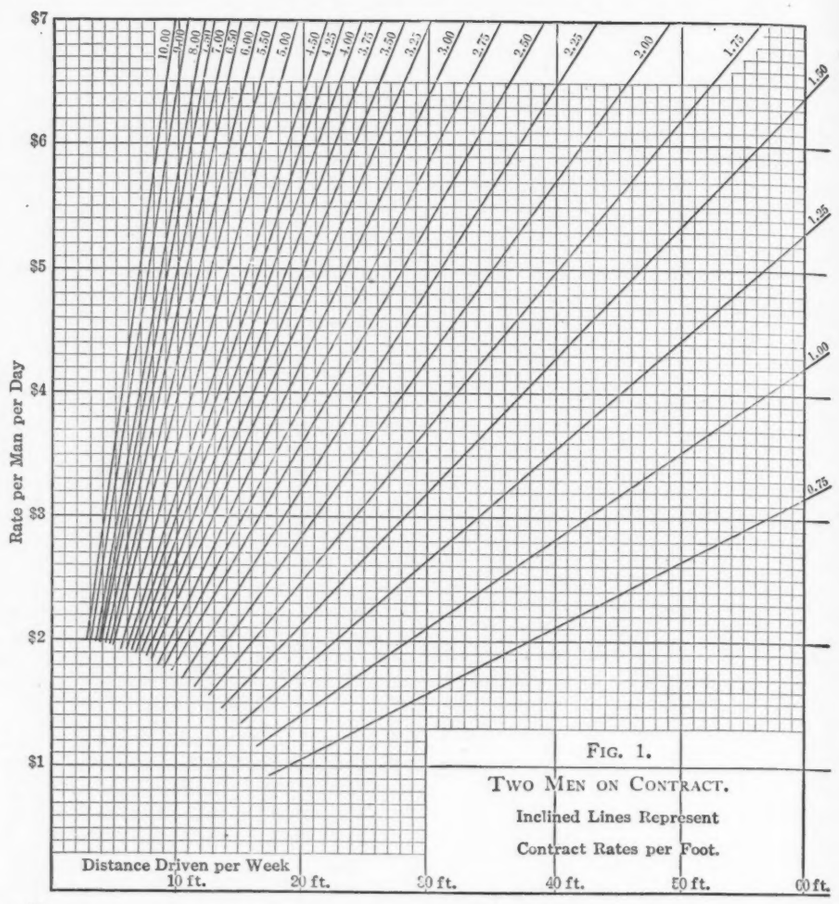


Fig. 1.

Two Men on Contract.

Inclined Lines Represent Contract Rates per Foot.

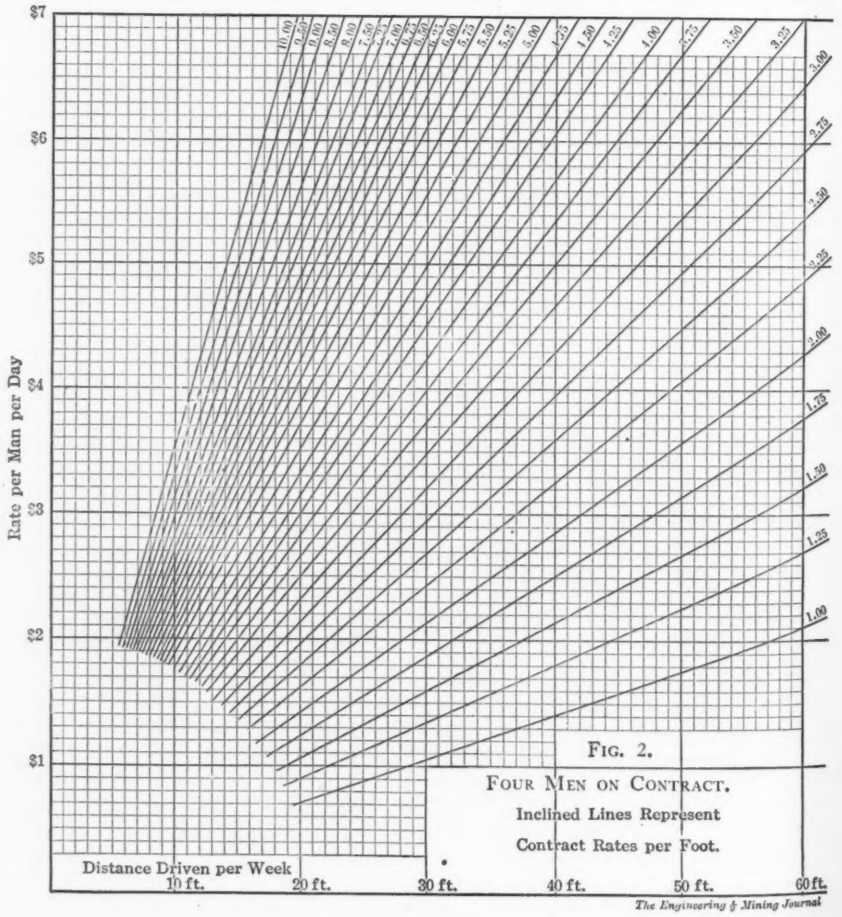


Fig. 2.

Four Men on Contract.

Inclined Lines Represent Contract Rates per Foot.

The Engineering & Mining Journal

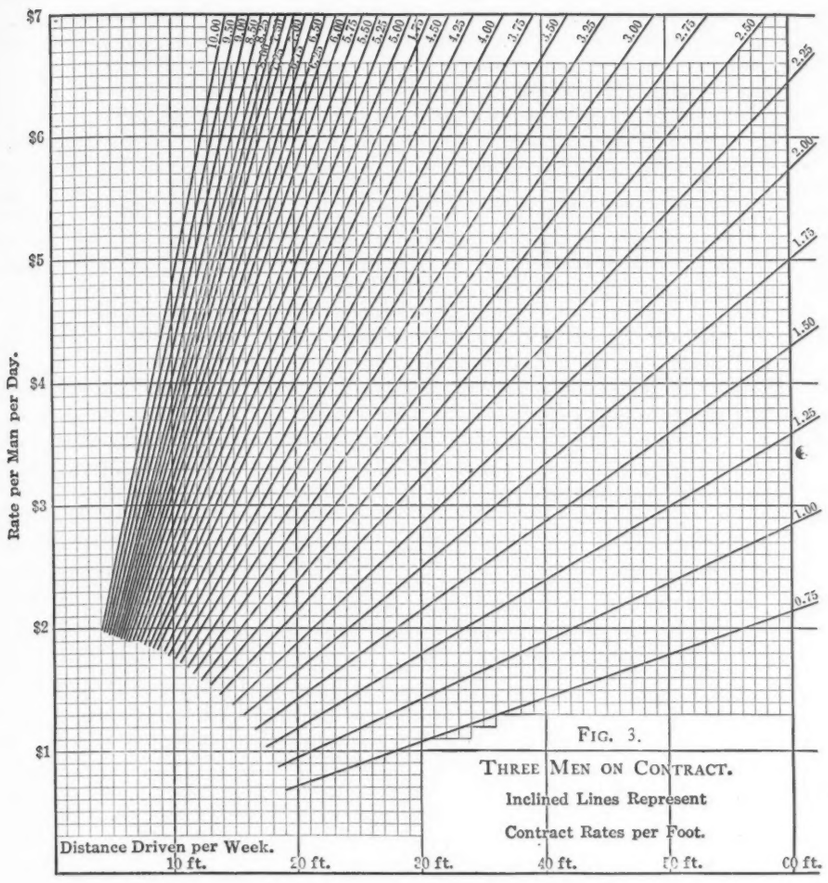


FIG. 3.

THREE MEN ON CONTRACT.

Inclined Lines Represent Contract Rates per Foot.

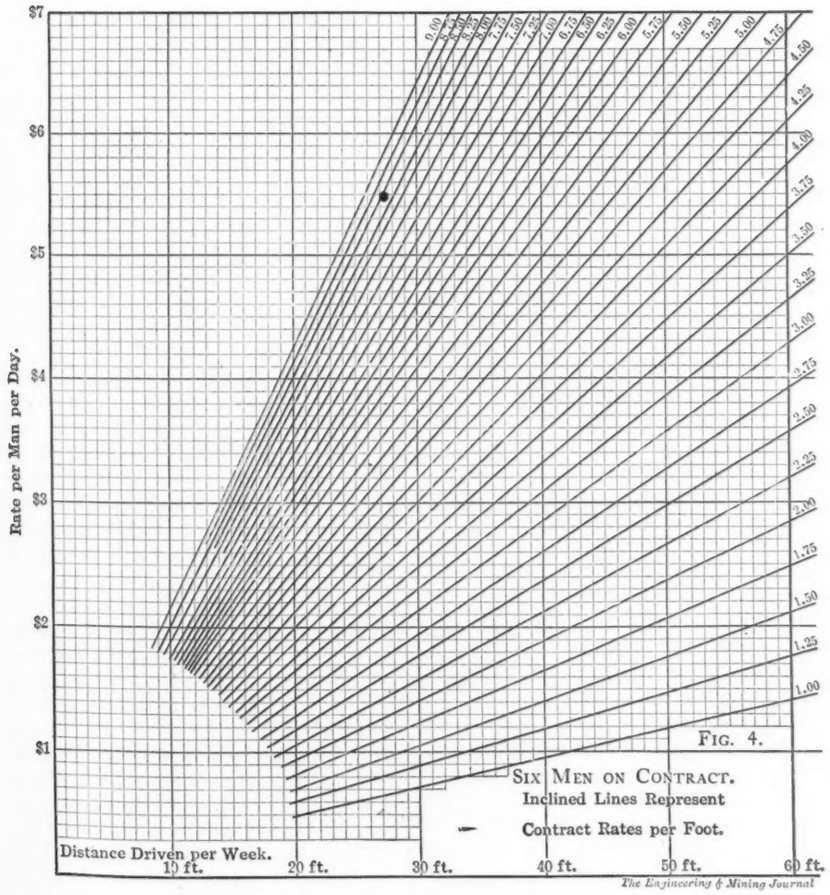


FIG. 4.

SIX MEN ON CONTRACT.

Inclined Lines Represent Contract Rates per Foot.

resent all the conditions when the contract rates per foot marked on them are paid and the crew of men employed is of the size for which the particular diagram is calculated.

CURVES BRING OUT INTERESTING FACTS

These curves are useful as at a glance one can tell what the men are earning a day from the rate of weekly advance they are maintaining. Or in making a contract one can read off the price to pay per foot when he has determined from the appearance of the ground what he considers a fair rate of weekly advance for the work, and the wage that he is willing to allow the men to earn provided they advance the working face as rapidly as is figured. From the diagrams can also be seen how much difference in the wages is going to result if the men drive faster than is estimated. The steep inclination of the lines on the diagram when the wage rate per foot is high and the weekly advance low, clearly illustrates the cause of the great variations in the men's pay checks when there is a small apparent difference in the advance they make in a week. This emphasizes the precaution that must be taken in letting high-priced contracts for work in difficult ground.

(To be concluded)

Bismuth in 1910

The bismuth situation developed no changes during 1910. The United States Metals Refining Company continued the production from its Grasselli (Ind.) plant, recovering the metal from lead bullion by the Betts electrolytic refining process. All of this product was controlled by one selling firm and the price was in accord with the price asked by the European interests which dominate the bismuth trade, that is, from $1.50 to $1.67 per lb. for the metal. So far as reported none of the smelters is paying for the bismuth in the base ores purchased and there is no reported production or export of bismuth ore from the United States for the year. The Beaver county, Utah, deposits were recently again investigated. Nothing was done toward the operation of the important bismuth deposits in a complex ore found in Sinaloa, Mexico, recently acquired by an American company. Experiments made early in the year indicated that this 2 per cent. bismuth can be recovered by lead smelting in a blast furnace. The Bolivian deposits continue to be the most important producers of bismuth ore outside the closely controlled Saxony. mines and practically all of the Bolivian output goes to the syndicate controlling the bismuth trade of the world. The imports of the metal into the United States during 1910 exceeded $300,000 in value.

NEW PUBLICATIONS

THE MINERAL INDUSTRY, ITS STATISTICS, TECHNOLOGY AND TRADE DURING 1909. Volume XVIII. Edited by Walter Renton Ingalls. $10. ENGINEERING AND MINING JOURNAL. McGraw-Hill Book Company, New York, sole selling agents.

My absence in connection with the Canal Zone meeting of the American Institute of Mining Engineers, and the accumulation of work, due and overdue, which has demanded performance since my return, have prevented me from giving to this volume an earlier examination and review. It is a privilege to write concerning such a book, because the necessary preliminary reading of it, however superficial, puts one in touch with all branches of mining and metallurgy, and brings up to date one's knowledge of many developments which had escaped one's notice. In fact, it belongs to that class which nobody is expected to read through at a series of consecutive sittings. Yet it is much more than a work "for reference," like a dictionary. My view of it may be, perhaps, best expressed by my use of it, as a consulting engineer and an editor.

I always go over a new volume of "The Mineral Industry," to find out what it contains, in a general way, so as to broaden my knowledge of what has been going on in technical progress; and especially to note, for future consultation, the contributions of experts in special departments. For it is many years since I remembered, or fancied that I remembered, everything I had once seen or read. There will come a time to every practitioner when he will have to employ his memory in recalling, not facts, but the places where they can be found recorded. He must let go the intimate knowledge of the textbooks he studied at school, to substitute a general knowledge of later and better authorities. For this purpose he ought to own, if possible, compilations of practice and literature, like "The Mineral Industry."

After thus familiarizing myself in a general way with the scope and contents of the volume, I put it in a place convenient to my desk for frequent consultation. Like every active engineer (and, by reason of my official position, to a larger degree than many others), I am continually consulted, by correspondence, concerning questions of the latest theory or practice in many departments, which I could not safely answer from my own "latest theory or practice." I take pride, as well as pleasure, in replying to these numerous inquiries intelligently and helpfully, if not completely. In an experience of many years, I have found that the work to which I first turn for aid in cases within its sphere, is "The Mineral Industry," not only because of its comprehensive and trustworthy statistics, and its invaluable expert contributions, giving references to technical literature, but also because each volume is a supplement to preceding ones, and the editor does not forget to refer to *them*; so that the latest volume always supplies, with regard to any pertinent investigation, that priceless "first aid," a starting point and a guide to further study. Such further study may often carry the inquirer into publications outside of his own library. If such publications are in the libraries of the mining, mechanical and electrical engineers, now housed in the Engineering Societies' building, I can assure all members of the American Institute of Mining Engineers that every practicable aid will be given in the consultation of them by correspondence. We can state to any member the nature and length of any given paper; the way to get a copy of it, if attainable; and the cost of a typewritten copy, if the article be out of print. Some day we hope to make this service even more complete. Meanwhile we are doing the best we can, in the lack of an adequate endowment for our library; and it is my conviction that an engineer who possesses a set of "The Mineral Industry," or even of its last few volumes, and the two indexes of our *Transactions*, covering respectively volumes I to XXXV and XXXVI to XL, inclusive, will be well prepared for any professional inquiry which he may encounter, and will be relieved of the necessity of buying many books which he does not frequently require, and which are sure to get out of date—perhaps before he happens to use them.

I have indulged in this long introduction because I have never been able to explain the comparatively limited sale of "The Mineral Industry." To me, it has always seemed to be a work which members of our profession must have. Yet I understand that it has been published for many years at so little profit as scarcely to warrant its continuance. And I know that its abandonment has been repeatedly contemplated, and that I have repeatedly urged the publishers to go on with it, rather than allow an enterprise so creditable to them, and so valuable to the professional public, to fail.

They deserve high praise for their course, not only in persevering, but in maintaining the standard of excellence established by R. P. Rothwell, its founder, for "The Mineral Industry." Whatever may be its ultimate fate, no one can deny that, in the hands of Walter Renton Ingalls, his successor, it has lost nothing of its authority and value. I am sorry, but not surprised, to learn that, with the completion of the present volume, Mr. Ingalls terminates his work as editor. Having been engaged for many years in similar, yet probably less arduous, labors, I can easily understand that the burden of this annual volume, added to his duties as editor of the ENGINEERING AND MINING JOURNAL, and his fruitful activity in other professional lines, has proved itself too heavy, even for his strength and industry. And I wish to express to him, in behalf of his colleagues all over the world, a grateful recognition of his splendid, unselfish work. It is pleasant to know that his retirement does not mean the suspension of the enterprise; and I can wish for his successor, my friend and former assistant, Albert H. Fay, nothing better than that he may be able to maintain, to an equal degree, the excellence and practical value of "The Mineral Industry."

I have left myself little room for comment upon the contents of Volume XVIII. Of course, it embraces, as usual, not only the statistics of production, etc., for 1909, but also the revised figures for 1908, and even, in some instances, for earlier years. This long established feature makes it important to consult always, for statistical information, the latest volume; and I consider it a happy solution of the old problem of combining early publication with authoritative accuracy in such statistical work. There is also a valuable chronology of mining events in North America during 1909; and a series of articles on the production of various substances, from aluminum to zinc. Following these is a highly interesting chapter, by Henry Lloyd Smyth, professor of mining and metallurgy at Harvard University, entitled "Notes on the Practice of Mining," which is mainly a critical review of the technical literature of the year, covering more particularly the principles and costs of mining, disasters in coal mines, and methods of shaft sinking, especially those which involve the use of concrete for shaft lining. The year's progress in ore dressing and coal washing is chronicled by that veteran observer, Prof. Robert H. Richards, of the Massachusetts Institute of Technology, assisted by Charles E. Locke, professor of mining in the same institution. and this chapter is reinforced with an admirable bibliography of the subject for 1909, embracing foreign as well as American publications. The subject of sampling and assaying is suggestively treated by F. F. Colcord, assistant manager of the United States Metals Refining Company, New York. But this list does not by any means exhaust the catalog of contributions by eminent experts; for, under the alphabetical enumeration of the different substances obtained by mining, there are articles by nearly 70 persons, outside of the staff of the ENGINEERING AND MINING JOURNAL, each of whom writes of a subject which he understands. Such a symposium of acknowledged authorities is seldom brought together. I heartily congratulate Mr. Ingalls upon this splendid piece of administrative and editorial management.

ROSSITER W. RAYMOND.

Model Coal Mine at Marianna

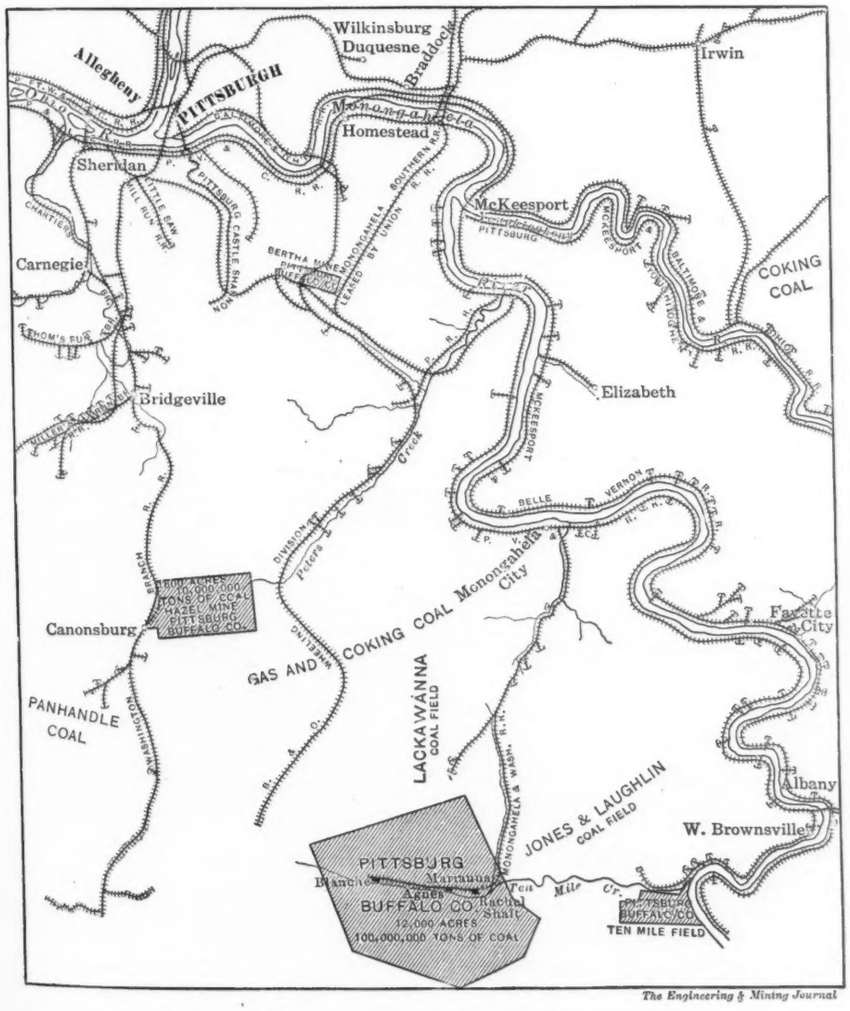
By A. C. Beeson *
and Floyd W. Parsons

First of a series of articles giving detailed description of most modern coal operation in America. The mine is designed for output of 10,000 tons per day, and no effort or expense has been spared to make the workings safe. Steel tandem cages with double pair of guides and steel mine cars holding three tons are used.

The Marianna mines, owned and operated by the Pittsburg-Buffalo Company, are situated in the extreme southeastern portion of Washington county, about one mile north of the Green county line, as shown by the accompanying map. The town of Marianna is on a branch of the Monongahela division, Pennsylvania railroad, about 19 miles from Monongahela City. The plant is built on the North Fork of Ten-Mile creek, and is about six miles above Millsboro.

With the exception of several mines along the river, Marianna is at present the only opening in the great continuous coalfield of about 800 square miles, which extends from the National road on the north to the Fairmont Outcrop on the south, and from the Monongahela river on the east to the outcrop along the Wabash railroad on the west; this is the field from which the famous Pittsburg industrial district must draw its fuel supply in the immediate future. This vast area is entirely underlaid with the celebrated Pittsburg seam of coal, which for continuity and uniformity of thickness and quality is unsurpassed by any geologic formation.

*Chief engineer, Pittsburg-Buffalo Company, Pittsburg, Penn.



COALFIELD BEING DEVELOPED BY THE MARIANNA MINES

FIVE SEAMS AVAILABLE

At Marianna, the coal seams present are, Waynesburg, about 70 ft. below the surface at the Rachel Shaft; Pittsburg, about 370 ft. lower; Upper Freeport, about 600 ft. below the Pittsburg; Upper Kittanning, about 110 ft. lower and Lower Kittanning some 40 ft. below the Upper.

The Waynesburg Coal outcrops generally in the southern part of Washington county, and attains a thickness of over 5 ft.; the seam yields a good grade of domestic coal, and occurring alone, it would form an attractive inducement for opening a mine; however, in the presence of the Pittsburg coal, with its superior quality and uniformity, it is at present mined only on a small scale. The oil well drill records show a thickness of five to six feet for the Upper Freeport and Lower Kittanning, while the Lower Freeport is missing. These lower seams are reserved for future mining. The Pittsburg seam in which the workings are located, has a thickness of a little over 6 ft., and here shows the well known quality of this seam in marked degree.

An average analysis of this coal is as follows: Water 0.92; volatile matter, 36.11; fixed carbon, 56.19; ash 6.78; sulphur, 0.99; phosphorous.

The run of mine coal has a calorific value of about 14,000 B.t.u. per pound of dry coal, and without any treatment produces a hard, bright coke containing less than 1 per cent. sulphur. The slack from this mine after being washed produces a coke of the same quality. The area of Pittsburg Coal owned by the Pittsburg-Buffalo Company in this field is over 6000 acres, containing, at a conservative estimate, an available supply of 50,000,000 tons.

THE SURFACE PLANT

There are four shafts driven to the coal; they are Rachel, the main hoisting shaft; Miller, the main ventilating shaft; Agnes, used for lowering men and supplies and hoisting slate, and Blanche, designed as a second hoisting shaft. Near the Rachel shaft are grouped the tipple, washer, power plant and coke ovens; the large ventilating fan discharges into the Miller shaft, while at the Agnes are placed the repair shop, bath and lamp house, and the smaller ventilating fan used during development and now standing in reserve.

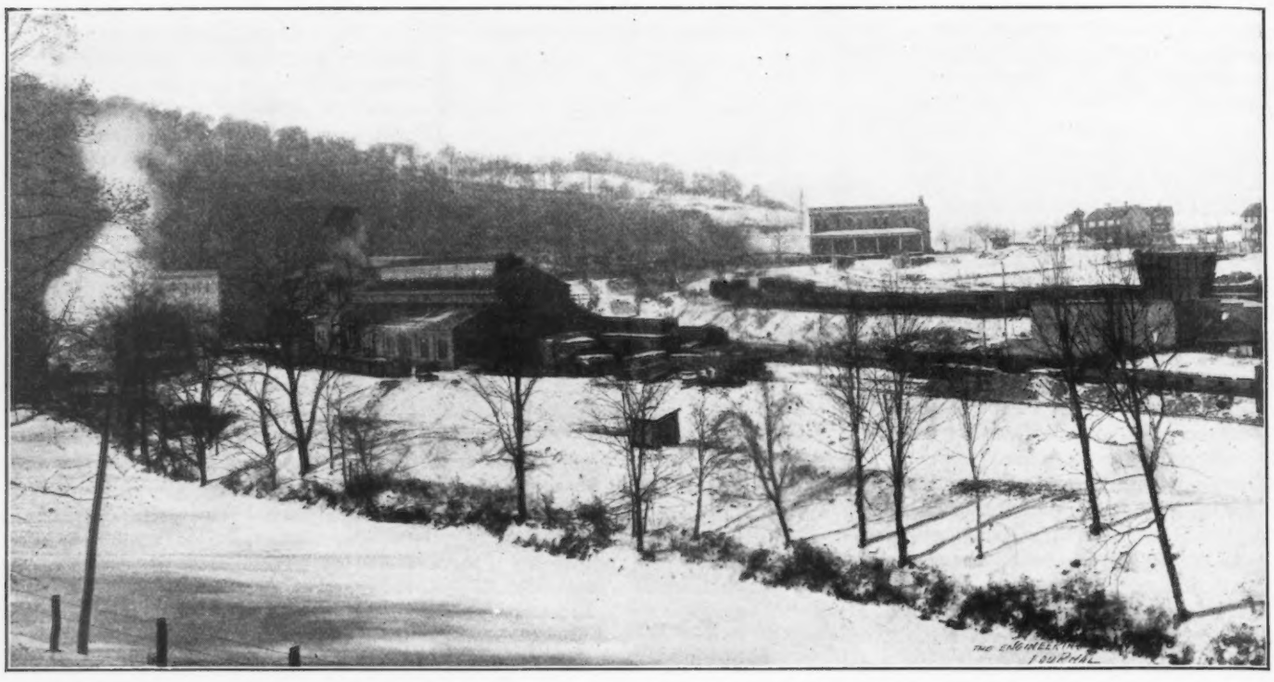
All shipments are made over the railroad already mentioned, the system of tracks for loading being indicated in the accompanying surface plan. The site of the plant is the present terminus of the

branch; the passenger trains stop on the main track about opposite the tipple, while the engine is turned on a turntable. Trains of empty cars are pushed up beyond the tipple to the storage yards, which have a capacity of 200 cars on each side of the tipple.

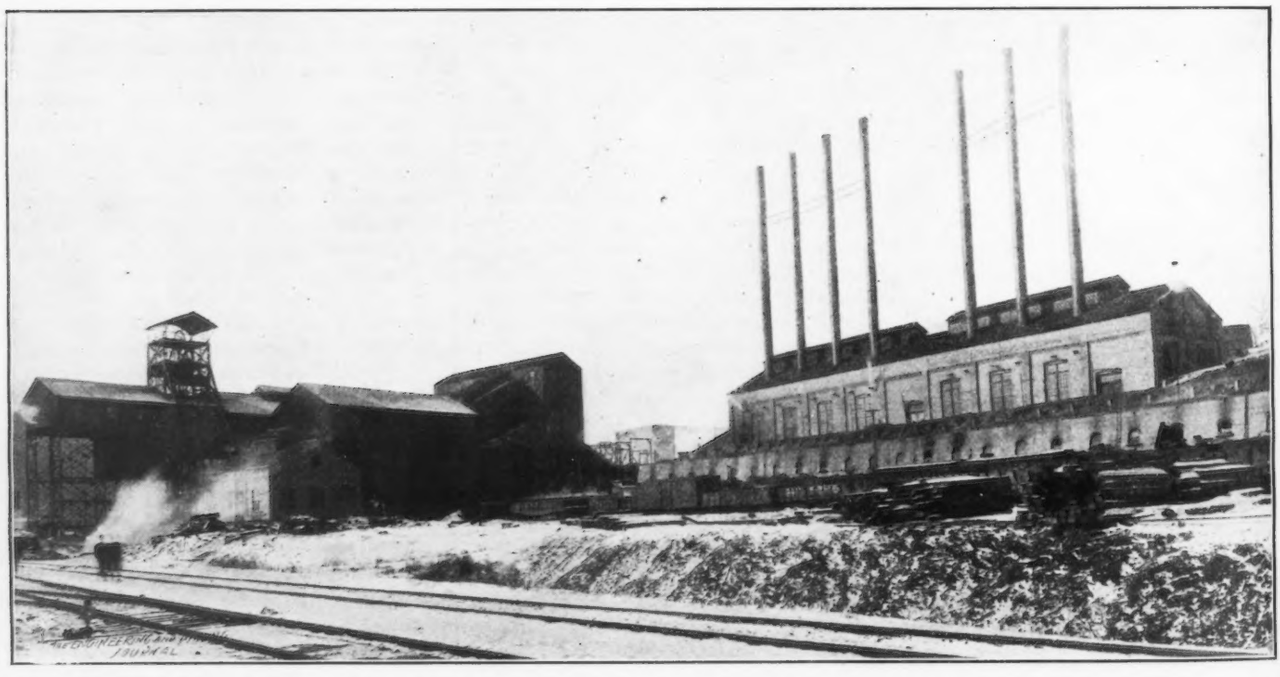
loads, except immediately under the tipple where 2 per cent. is provided for a length of 100 ft., so that the cars are handled entirely by gravity, dropping down when loaded into the receiving yard, where the trains are made up.

Besides these tracks there are supply road tracks there are numerous service tracks.

A system of standard gage tracks is so arranged that the electric larries can deliver washed slack from the washer to the coke ovens, washed or raw slack, or crushed bone coal to the boiler house,



SHOWING THE SUPPLY SHAFT, MACHINE SHOP, BATH HOUSE, STORE AND MAIN VENTILATING FAN AT THE MILLER SHAFT



VIEW AT MARIANNA, SHOWING THE RACHEL SHAFT WITH TIPPLE, WASHERY, POWER HOUSE AND COKE OVENS

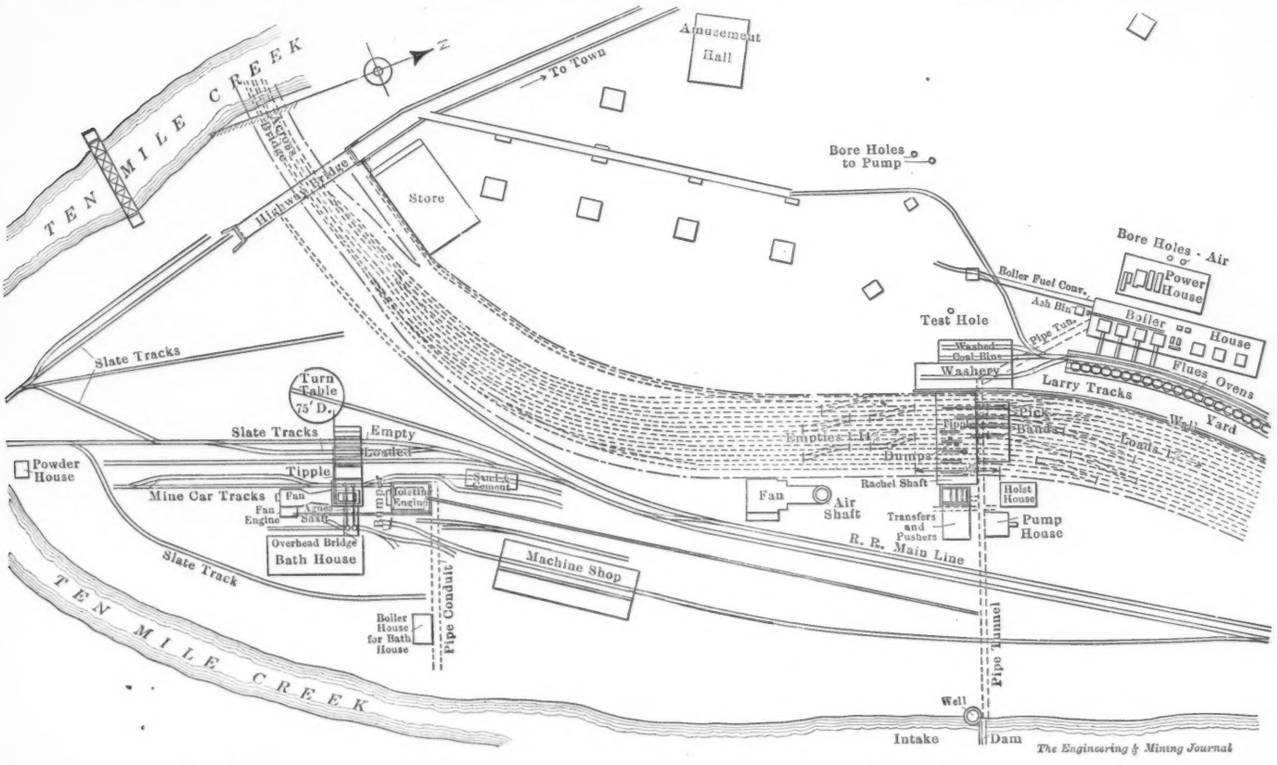
The storage yard is provided with a system of cross-overs to facilitate classification. The tracks are arranged to load nine different grades of coal, besides coke and washed slack; the tracks have a grade of 1.1 per cent. in favor of the sidings as shown, which extend beyond the Agnes shaft and terminate in a yard convenient to the repair shop, the supply shaft and the main road to the town. A sand dryer and cement house are located close to these tracks. Besides the rail- and washer refuse or boiler ash to the waste dumps.

Another system of service tracks is of 4-ft. gage, and is intended for mine cars. It is quite complete, connecting the surface landing at the Agnes shaft with the

supply house, repair shop and storage yard. Several turntables and numerous sidings are included, which provide for easy loading of mine materials, repairs to cars, etc.

The Mine Buildings

All of the mine buildings were carefully designed to have ample space, light and strength; they are built of incombustible material throughout and are pleasing in appearance. The walls are of 13 in. thickness in panels, and 17 in. in pilasters, and are formed of a buff-colored brick, made by the company at its plant at Johnetta, Penn. These bricks are larger than building bricks. They are thoroughly vitrified and are well suited to the purpose. The floors are of reinforced concrete supported on steel beams. The roof is of reinforced concrete tile laid directly on steel purlins which are supported by heavy steel roof trusses. Lanterns having steel louvers are formed above the roofs.



SURFACE PLAN, SHOWING ARRANGEMENT OF TRACKS AND BUILDINGS AT THE MARIANNA MINE

The Hoisting Plant

At the Rachel shaft, two mine cars of coal in tandem are hoisted on each cage. These cars are of steel and weigh about two tons each, empty. They have a capacity of 90 cu.ft. or three tons of coal each. The cage is of structural steel as shown in the accompanying drawing. The floor is of oak plank supported on a channel frame. The load is supported through heavy side plates and top framing by bridle chains and clevises. These are designed to have a factor of safety of 20. The cage travels between two pairs of guides; this is necessitated by its great length.

The cars are retained on the cage by a block, consisting of a gravity tilting dog and a vertically moving stop. The cars always travel on and off the cage in the same direction, so that the tilting dog serves merely to prevent motion in the opposite direction. The stop is normally held up by a counterweight, and automatically stops the car when coming on the cage. In taking off the cars, the stop is lowered by a pull on a handle conveniently located on the side of the cage near the end. The stops engage the chain-haul attachment on the bottom of the car.

The cage is held at landings by extra-heavy cast-steel landers of the type in general use in the bituminous region. Automatic safety gates are provided at the tipple landing, and hinged steel gates at the ground landing, where the shaft is entirely inclosed by a steel fence bolted to the headframe. The weight of the cage is about 11 tons; this, together with 6 tons of coal, 4 tons of cars, and 1 ton of hoisting rope makes a total load of 22 tons on each winding drum.

Hoisting is done in balance, but the engines are designed to be able to start the entire load; so that if for any reason, one compartment of the shaft should be idle, hoisting could be done in the other.

An Unbalanced Load of 22,000 Pounds

The hoisting engine is a first-motion twin-cylinder, piston-valve, simple engine, having cylinders 36 in. in diameter and 60-in. stroke. It will hoist the maximum unbalanced load of 22,000 lb. a hight of 500 ft., four times in one minute. This engine was built by the Mesta Machine Company, and is of the heavy construction used by this company for heavy-service rolling-mill engines.

The reversing gear is of the Stephenson link type, operated by a steam cylinder with oil cataract. The valve gears for steam and oil are attached to a floating lever, which automatically restores the valves to mid-position; thus locking the link motion at any point desired by the operator.

The drum is a double cone of cast iron, the end diameter being 10 ft. and the center diameter 12 ft. A flanged brake surface is cast on each end on which bear oak blocks carried on cast-steel brake beams. The brakes are steam operated in a manner similar to the reverse.

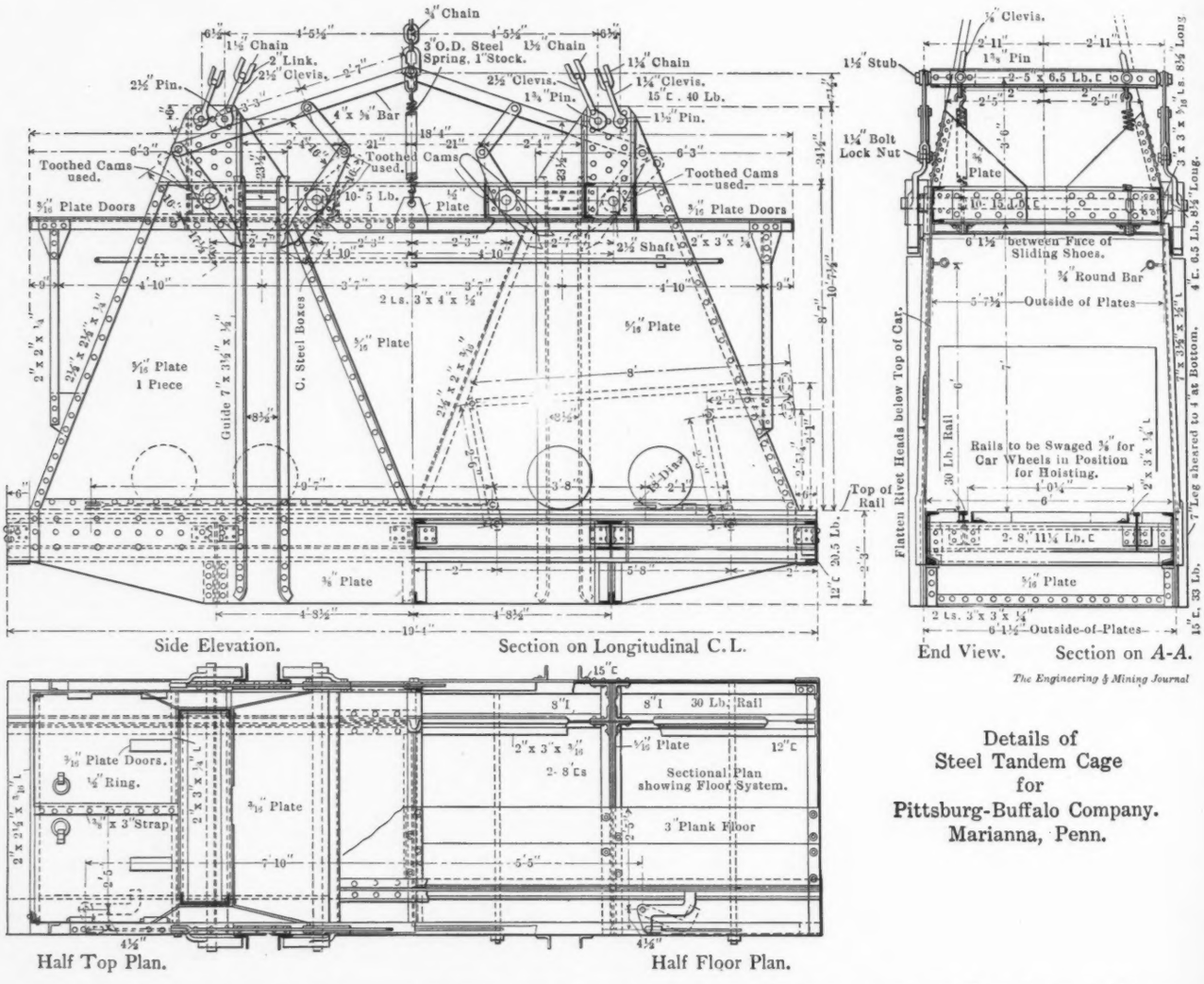
Slack-rope Device

A special device of original design is attached to the drums for the purpose of taking up the slack in the rope. The drum is in two halves, one for each rope. One-half is fixed on the shaft and the other is loose. Each rope passes through the shell of the drum and is clasped permanently to the shaft. Mounted on the inside of the fixed drum is a worm and wheel, the worm shaft having a square end projecting through the fixed drum shell, on which a hand crank may be placed. A small pinion on the worm-wheel shaft meshes with an internal gear

ring bolted to the loose drum; thus turning the crank, the loose drum can be made to revolve on its shaft with respect to the fixed drum. Slack is taken up by moving the engine until the rope on the fixed drum is taut; then turning the crank until the rope on the loose drum is taut.

This device is successful, adjustment being so simple, easy and quickly accomplished, that the relative positions of the two cages can easily be kept true by frequent adjustment; thus avoiding many small delays in landing. The permanent valuable adjunct in making engine repairs rapidly and efficiently, thus preventing, or at least limiting, a shutdown of the entire plant, which is liable to result from the idleness of this important unit. It has also been demonstrated that a large proportion of the cost of the crane is saved by its use in erecting the engine.

The basement of this building contains all steam connections, piping, separators, traps, etc., conveniently arranged and easily accessible. The steam pipes lead from the main pipe tunnel which passes 7 ft. to 8 ft. diameter, grooved for 1½ in. diameter wire rope. These drums are equipped with steam and hand brake, steam- and hand-link motion, reverse and Nicholson patent automatic stop to prevent overwinding. The engine house is similar to that at the Rachel shaft, having a 10-ton traveling crane, basement piping, etc. The next article dealing with operations at Marianna, will outline the ventilating system, and describe the 35-ft. steel fan, the largest ventilator in any bituminous coal mine.



Details of
Steel Tandem Cage
for
Pittsburg-Buffalo Company.
Marianna, Penn.

THE CAGE WEIGHS 11 TONS, AND BECAUSE OF ITS GREAT LENGTH, IS DESIGNED TO TRAVEL BETWEEN TWO PAIRS OF GUIDES

connection of the rope is, of course, not disturbed even when it is desired to pay out rope when worn rope is cut off at the cage. The engine is equipped with the Mesta automatic safety device, which prevents the possibility of overwinding.

The engine house is provided with a hand-operated overhead-traveling crane of 25 tons capacity. This is a convenience not always found in hoist houses, but experience has shown that in a mine of large capacity, it is an important and close to the building.

At the Agnes shaft, only one car is hoisted on the cage, so that the duty is lighter. The cage landings, gates, etc., are similar to those at the Rachel shaft, already described, except for the difference in size and capacity, and the use of two instead of four guides.

The hoisting engine at Agnes shaft was built by the Vulcan Iron Works, at Wilkesbarre, Penn. It has two 24x48-in. cylinders, also drums tapering from

That oil may be found in some parts of the Cantua-Panoche region which lies just north of the Coalinga field in California, is the conclusion of Robert Anderson of the U. S. Geological Survey. As a whole, however, the territory does not promise to rival the Coalinga field. A recent press bulletin issued by the Survey states that the most favorable indications are in the north side of the east end of the Vallecitos, 24 miles from the nearest producting well in the Coalinga district.

Proposed Layout for a Shaft Bottom

The shaft-bottom layout here shown was presented by W. E. Fohl before the June, 1910, meeting, of the Coal Mining Institute of America, held at Uniontown, Penn. It was thought advisable to continue its discussion at the winter meeting; accordingly the author was requested to have a cut made, and to furnish each member of the Institute with a copy of it, as well as a brief description of its intention, with the request that any suggestions concerning it be sent to W. E. Fohl, 2224 Farmers' Bank building, Pittsburg, Pennsylvania.

Mr. Fohl will be pleased to accept any comment offered; a single valid objection may necessitate the abandonment of the entire plan. On the other hand, if anyone has knowledge of existing shaft-bottom layouts, or has in mind original ones which he desires to present to the institute, Mr. Fohl will arrange to have them included in future discussions.

Details of the Plans

In the plan presented there has been assumed a favorable grade toward the shaft directly on the face of the coal. The hoisting shaft is elliptical, lined with reinforced concrete, and having four compartments.

The air shaft is circular, has a single compartment, and can be lined either with concrete or masonry.

The manway is here shown as a slope, and it is intended, also, to accommodate all pipe lines which are not taken down through separate bore holes. In the event of a prohibitive depth, this should be replaced by a two-compartment shaft, the one compartment of a size to accommodate all pipe lines, and the other compartment of the ordinary size, fitted out with independent hoisting appliances for the movement of men and supplies only.

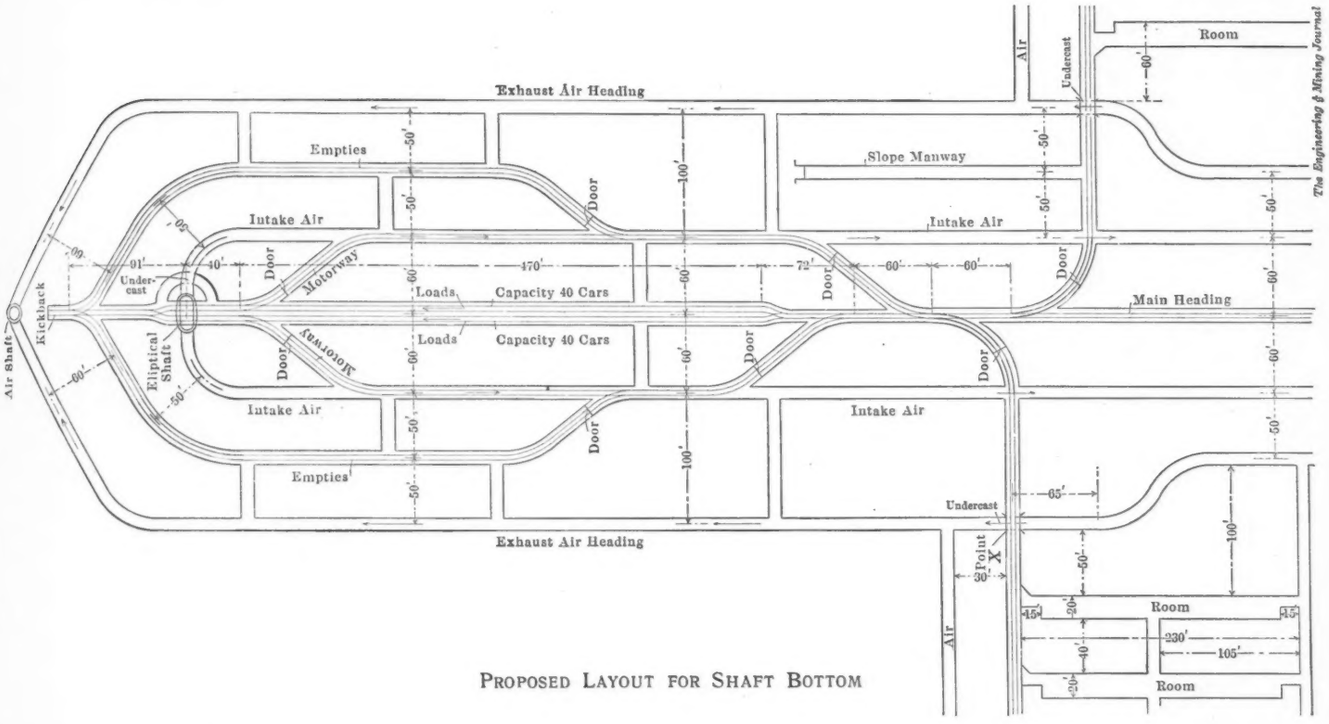
The ventilation is exhaust induced by a fan placed near the circular air shaft. It is to be entirely cut off from the intake airways by masonry stoppings in the cutthroughs necessary when the airways are first driven, and to be conducted through undercuts at all crossing points.

Placing the Doors

Particular attention is called to the placing of the doors. If these were air tight and all the cutthroughs along the main haulageway bratticed, it will be seen that no air could enter the mine except through the end compartments of the elliptical hoisting shaft (the intention, of course, being to have them partitioned off from the hoisting compartments). It will be readily seen, too, that by regulators near the face of the main haulageway, its ventilation can be controlled as desired. The advantages of this are apparent; no swift currents to pass over moving, loaded trips, nor to interfere with the men working at the shaft bottom in cold weather.

It is not necessary, however, that any of the doors be perfectly airtight, as they are merely the means of separating two currents of fresh air. It will be seen, too, that an accident to any or all of the doors can have no other effect than to admit more fresh air than is necessary or convenient into the main haulageway or the storage tracks for empty cars at the shaft bottom. In the light of these facts, it is proposed to have all the doors hung to swing both ways, requiring no attendance.

The importance of the proper start in laying out a mine is without doubt fully appreciated by all, and it is hoped that all those who have suggestions will contribute of their knowledge and experience for the common benefit of the mining industry.



Proposed Layout for Shaft Bottom

A Commission Appointed to Study Coal Mining

The commission recently appointed by the governor of Colorado to study coal mining in that State and to draw up a bill for submission to the eighteenth general assembly, with a view to preventing as far as possible such mine disasters as those that occurred recently at Starkville, Primero and Delagua, Colo., immediately begun its work by visiting the Standard mine, near Lafayette, Colorado.

The explosive properties of coal dust will be investigated. State Geologist George has been added to the commission by Governor Shafroth. The other members of the commission are Victor C. Alderson, of the State School of Mines; State Coal Mine Inspector James Dalrymple and Professor Ekeley, of the University of Colorado.

In discussing the work of the commission, Inspector Dalrymple said the commission would visit mines in El Paso, Las Animas and Gunnison counties, in addition to one or two mines in the Boulder district.

French Experiments on Coal Dust

By Henry Briggs *

In concluding his experiments, Mr. Taffanel, the French expert, discusses the influence of the state of division and the percentage of volatile matter in any dust. He also shows the advantages of using stone dust as a medium to prevent explosions, and states that dust found on roadways is generally incapable of being fired.

*Heriot-Watt College, Edinburgh, Scotland.

Concerning the influence of the state of division of coal dust, it was found that the finer the dust, the more easily is it exploded. The influence of the state of division was made very manifest by the experiments. In testing two samples of Lievin dust, one of which left 33 per cent. of its weight on a screen having 75 holes per linear centimeter[1], while the other left only 1½ per cent., it was found that the lower limit of inflammability was almost double with the first what it was with the second dust, their respective velocities of flame (using favorable dust-charges in each case) was 50 and 65 m. per second, while the violence of the explosion was noticeably less in the first case. It was also found, with a dust of which 75 per cent. refused to pass the screen, that it was not possible to produce a dust explosion under the conditions of the experiments. Similar important differences were established with dusts respectively containing 24 per cent. and 11 per cent. of volatile matter.

The State of Division Has an Effect on the Speed of the Flame

The influence of the fineness of the dust is easily explained: In the first place, the finer the dust the more easily and completely is it thrown into suspension, and hence the greater is the chance of a given weight of explosive producing an ignition. Again, the state of division has an effect on the speed of the flame in a dust-cloud, the effective area from which volatile matter may be distilled being greater the finer the particles; moreover, these fine particles are more rapidly heated to the temperature of ignition throughout their mass, and burn quicker by reason of the greater total surface they expose. The last-mentioned effects are actually of more weight than the greater facility by which the volatile matter is evolved in fine dust, it being in coarse dust where the influence of the proportion of volatiles preponderates.

Importance of the Proportion of Fine Dust on Roadways

It is, therefore, evident that to the experimentalist the regulation of the fineness of the dust is of great importance; by varying the state of division he may produce at will explosions of varying degrees of violence. From the practical standpoint it is necessary to emphasize the fact that the danger of dust does not so much lie in the total quantity in a mine roadway—which is nearly always amply sufficient—as in the amount of fine dust present. The proportion of dust capable of passing a screen with 190 meshes per inch furnishes a good criterion as to whether it is dangerous in character or not.

[1]Equivalent to 190 holes per linear inch.

Influence of Percentage of Volatile Matter Contained in Dust

The study of dust containing different proportions of volatile matter is of great importance in that it provides the means of classifying mines with respect to the relative inflammability of the dusts found in them. The influence of the volatile constituents was revealed by preliminary experiments on dust clouds formed prior to the shot being fired into them, when it was found impossible to inflame dusts with less than 11 per cent. volatiles. (This percentage is calculated on the "true coal," that is, on the coal from which the ash had been eliminated). Dust with 15 per cent. was inflammable, but the flame was only propagated slowly through it; from 27 per cent. the flame was quicker, while the maximum rate of travel of the flame and the greatest facility of ignition was observed for coal containing 30 or 31 per cent., and with lignites which hold a much greater proportion of volatile matter.

The experiments in the 65-meter gallery gave analogous results to the above; dust with 11 per cent. of volatiles only caused an elongation of the flame of the explosive, the flame extending 16 to 22 m. when a heavy charge of explosive was used. Dust with 15 per cent. was found to ignite easily, but the flame did not extend the whole length of the gallery. The same result was attained with dust containing 18 per cent., though in one case of an exceptional nature, in circumstances very different from those usually obtaining underground, an explosion running from end to end of the gallery was obtained with a dust of this kind. Complete propagations were only achieved with dusts containing 24 and 30 per cent. volatiles, the latter dust being the more easily fired and producing the more violent explosion.

It Is not Only the Quantity of Volatile Matter That Rules the Inflammability of a Dust

It is seen that there is a good general concordance between the two series of tests, though there is a difference in the two cases in the percentage of volatiles corresponding with the lower limit of inflammability: With dust previously thrown into a cloud, the lower limit is situated between 11 and 15 per cent., but when the dust has to be lifted into the air as well as ignited, the limit lies between 18 and 24 per cent. This discrepancy is a necessary consequence of the mechanism of dust explosions, and follows from the fact that when a dust is fired containing a proportion of volatile matter approaching the lower limit, the flame travels so slowly that it is unable to lift an adequate further supply in front of it, and dies out, yet were it able to feed on dust previously raised, it would better be able to travel forward.

The study of the combustion of dust from the chemical standpoint has furnished reasons for the influence of the volatile matter. It has been found that the hydrogen and hydrocarbons play a very important part in the combustion even with coals containing relatively a low proportion of these gases. With coals poor in these products, a less abundant supply is distilled in a given time, and a slower rate of propagation results. It is not certain that it is only the *quantity* of volatile matter that rules the inflammability of a dust, and it is probably true that regard should be paid to the composition of the volatiles and to the relative ease by which they are set free. In this connection a series of useful experiments could be made with dusts of different classes of coal, all containing the same proportion of volatile matter.

It may, however, be taken as a first approximation, that with a mode of firing comparable with that used in the experiments, a dust explosion is not likely to occur with dust containing less than 18 per cent. volatiles, while the probability of an explosion, and its violence (should it occur) increases largely as the percentage approaches 30. In all probability the limit will not be so low as that stated with dust which is finer than that used in the experiments or with a mode of firing of greater intensity.

The Influence of the Purity of the Dust, and the Effects of the Admixture of Stone Dust

The last, though not the least important point to be discussed is in regard to the effect of mixing stone dust with inflammable coal dust. On this point also the preliminary series of tests gave encouraging indications; it was found that coal dust became less and less easy to fire, and the resulting speed of the flame became smaller and smaller, the greater the proportion of stone dust mixed with it. When about 60 per cent. of stone dust was added, all that was noted was a lengthening of the flame of the explosive; in the majority of cases even this was hardly perceptible, though now and then the flame traveled 5 to 6 m. in the dust cloud.

The experiments in the 65-m. gallery gave results of the same kind; using the same fine coal dust containing 30 per cent. volatiles mixed with powdered shale —the shale being obtained underground and pulverized at the surface—it was established that the difficulty of ignition increases with the proportion of shale dust added. With 30 per cent. of shale-dust the flame traveled with difficulty, and was only carried through the gallery when heavy dust-charges or extra strong charges of explosive were employed.

The Limiting Proportion of Stone Dust

The limiting proportion appeared to be 40 per cent., at which percentage it was only exceptionally that the slow flame was able to pass right through the gallery. There was hardly ever an ignition with 50 per cent. of stone dust, and the flame never reached the mouth of the gallery; with this proportion the most that resulted from using extra heavy charges of dust or explosive was the prolongation of the flame of the latter to 22½ m. from the cannon.

The limiting proportion of 40 per cent. is lower than that obtained in the preliminary tests where the cannon was fired into a ready-made cloud; the reason for this has already been stated; with slow rates of travel the amount of dust the flame can raise is inadequate to support it, and, therefore, it dies out.

It is remarkable that so small a proportion of non-inflammable dust has so marked an effect on the inflammability of the mixture and on the rate of travel of the flame, especially when it is remembered that much more considerable additions of carbonaceous dust, bringing the total quantity greatly in excess of that which could be burned by the available oxygen, did not prevent an explosion being carried forward. Yet the excess of coal dust must have had a greater cooling effect than the much smaller supply of stone dust. To explain this peculiar result it is necessary to recall a conclusion stated when dealing with the influence of the quantity of dust thrown into suspension, *viz*: The effect of an excess of coal dust (or of stone dust) is to diminish the inflammability and the speed of the flame, owing to the heat it absorbs lowering the temperature of combustion, and also because, in adding to the opacity of the cloud it interferes with the transmission of heat from the zone of combustion into the cloud in front of that zone. These retarding influences are offset in the case of the excess of coal dust by the more rapid distillation of volatile matter from the increased surface exposed by the dust, and also through the fact that in an over-charged cloud there is a greater number of very fine and, therefore, extremely inflammable particles. But no such compensation exists when the excess is formed of stone dust. Hence the great difference in behavior.

The Proportion of Non-inflammable Dust Existing Underground

The remarkable influence of non-inflammable dust led to an inquiry being made to ascertain in what proportion it exists in the dust found underground. An approximate idea of this may be formed from the percentage of ash in the dust obtained in the mine, but, for the reason given in the next paragraph, such a result can only be approximate.

When 40 per cent. of shale dust is added to a coal dust, an analysis of the mixture would not necessarily show 40 per cent. of ash, for it will be necessary to take into account the amount of ash and moisture contained in the coal itself and the amount of volatile matter contained in the shale. In the case of the dusts used in the experiments it was found that when all allowances had been made such a mixture contained less than 40 per cent. of ash. It is further to be noted that the ash which forms an integral part of the coal probably does not act in the same way as the shale dust added, for it is only the latter which, when flung into the air, serves as a screen in obstructing the transmission of heat. Thus it is probable that a coal dust containing normally 30 per cent. of ash will be more inflammable than a pure dust of the same degree of fineness and containing the same percentage of volatiles which has been mixed with 30 per cent. of stone dust. To obtain a better knowledge of the character of a mixture of stone and coal dusts, the ash determination should be supplemented by an estimation conducted by immersing the mixture in a liquid of specific gravity about 2, formed, for example, of a solution of ethylene bromide in alcohol; the stone dust will sink in the liquid and thus permit of it being separated out.

Inquiries conducted in a number of French mines have shown that in the generality of cases dust taken from underground roadways contains a large amount of stone dust which has been produced from ripping the roads, tramming rubbish, repairs, wear of the floor by the feet of men and horses, and sometimes from dross and boiler ashes which have been strewn therein. Analyses showed that such dust usually contained more than 40 per cent. of stone dust; in other words, it was proved that in the majority of cases the dust was incapable of being fired by means comparable with those employed in the test-gallery.

It is a simple matter in most mines to add to the amount of non-inflammable dust by spreading crushed slag, or any other finely powdered incombustible material that happens to be at hand. A good method, suggested by Sir Henry Cunynghame, consists of strewing on the floor, and flinging into the walls non-inflammable matter made up of a mixture of fine dust and small pieces; the fine dust is useful in that it is easily thrown into suspension, while the small pieces, when flung against the walls bring down any coal dust adhering thereto. In this way the coal dust will be concentrated on the floor, whence it is less easily lifted than from the walls, and where it will soon become intimately mingled with stonedust.

Favorable and Unfavorable Conditions

In concluding his article, Mr. Taffanel includes in a condensed form the various observations given in the preceding sections.

The experiments in the 65-m. gallery have defined for a certain number of typical cases the conditions favorable and unfavorable to the production of coal-dust explosions. These conditions apply to the initial phase of an explosion, and not to its subsequent development. Consider, for example, the tests on a mixture of coal and stone dusts containing 50 per cent. of the latter. It was found that by firing unstemmed charges of 160 grams and 320 grams of gelatin, no generalized inflammation of such a mixture could be produced. It was also found that the same negative result was given when an explosive mixture of 8 cu.m. of firedamp and air was used in place of the gelatin. However, if the dusts existed as a ready-made cloud they would then carry flame. Hence, if in some portion of a mine favorable to such an occurrence, an explosion were to arise, and if it were violent enough to throw into suspension the dust in a zone where the mixture held 50 per cent. of its weight of stone dust, the flame would be carried forward through the zone.

Speaking generally, it is much more difficult to stop an explosion which has got well under way than to prevent it arising. In consequence, if it is not certain that the conditions are everywhere unfavorable to an explosion throughout the mine—and we cannot always be sure of this—it is necessary to be on the look-

out for some means or method by which an explosion may be arrested after it has developed. This necessitates research of a different character to that already undertaken, and in 1909 a new series of tests were commenced in the gallery lengthened to 230 m.; these are described in a separate report.

Even in regard to the initial phase of an explosion the tests now under discussion have not completely solved all the problems that have arisen; only a small number of different coals was tested, and every combination of the variables of the problem was not made. For example, there was no experiment performed on coal dust containing between 18 and 24 per cent. of volatiles, mixed with stone dust; nor were any experiments made in atmospheres containing a little firedamp.

It is necessary to consider these results as giving a first approximation in the solution of the problem as to what mines or galleries are such as would allow an explosion to occur. They permit us to state that the likelihood of such an occurrence is very small in the five following conditions:

1. When the weight of free dust is distinctly less than 112 grams per cubic meter of air.
2. When the material is spread in the form of grains, 1 to 2 mm. in diameter, and having mingled with it only a very small proportion of dust capable of passing a screen with 190 meshes per linear inch.
3. When the coal does not contain more than 18 per cent. volatile matter.
4. When the incombustible constituents are in a proportion at least equal to two-fifths of the weight of the dust.
5. When there is, in contact with the dust, a weight of water at least equal to that of the dust.

Although the risk of explosion is very small under the above conditions, it cannot be said to be entirely absent, for with more finely divided dust, with an initial ignition of greater intensity, when a small percentage of firedamp is present, or perhaps when the gallery is different in dimensions and arrangement to that used in the tests, the limits will be altered. However, the finest dust used in the experiments appears of much the same size as the finest that forms underground, while explosives fired in ordinary shot holes are much less likely to give rise to explosions than gelatin fired in a cannon without stemming.

Firing a Large Quantity of Firedamp

It is considered that only the firing of a large quantity of firedamp will be capable of so greatly modifying the initial conditions of an explosion as to disturb seriously the limits above stated, for then the problem will have changed and will have become more comparable with that of arresting a generalized explosion; in such circumstances the limits will be very different. If we may except this last case —which evidently will have an importance commensurate with the likelihood of a firedamp explosion in any particular mine—the limiting conditions stated above will hold good as a first approximation. If they do not guarantee an absolute immunity from risk, yet, on the other hand, it is true that there are many dusty workings where the conditions are not completely satisfied which are nevertheless of a character unsuited to the initiation of a dust explosion: it is probable, for instance, that with some coal dusts containing 24 per cent. volatiles there would be no need to raise the proportion of noninflammable matter to 40 per cent. in order to prevent an ignition.

It must further be remembered that the conditions set forth act in combination; —one helps another—therefore circumstances favoring explosions occur less frequently than would have been the case had they been independent.

These considerations have led to the belief that in France, at any rate, underground circumstances, favorable to the initiation of a dust explosion, seldom exist; it therefore follows that the initial cause (a blowout shot, for example) will most likely take place under conditions unfavorable to an explosion. Under such conditions all that would result from the presence of dust would be a lengthening of the flame of the explosive or of the firedamp ignition, or perhaps a slight local inflammation of dust.

Explosions Are Either Local or Quite Extended

For the reasons just stated, large dust explosions can only be extremely rare. But as the conditions affecting the development of an explosion are less proscribed than those concerning the initial phase, it is probable that many underground roadways are such as would allow the propagation of a dust explosion which had got well under way, or of a strong explosion of firedamp.

An appeal to statistics upholds these conclusions, for they tell us that explosions are either local and of small importance, or disasters extending through a whole district, or throughout the whole of a mine—while those of size intermediate between these extremes are almost unknown.

A generalized explosion is difficult to bring about, but when it occurs it appears capable of extending indefinitely.

The methods of arresting dust explosions must be left to a later report; the experiments in the 65-m. gallery have, however, brought out the means of reducing the risk of their initiation:

Evidently it is not possible to alter either the state of division of a dust or the quantity of volatile matter it contains. Endeavor may be made to remove the dust with a view to reducing the quantity below the amount equivalent to the lower explosive limit, but this process is not a practical one, and is often of no avail. Good results are obtained by sprinkling the floor and walls of roadways; but wherever it is difficult to keep the dust constantly wet, or where there are other objections to using water, it would seem that the method of strewing stone dust is the most efficacious and practical, and stone dust possesses the great advantage over water that it does not evaporate. The experiments showed that the quantity of stone dust to be added to render a coal dust innocuous is not excessive and is, indeed, such as could be introduced in the majority of cases without difficulty.

It is to be noted, however, that it is easier to render a small amount of dust innocuous than a large one, either by water or stone dust. We should, therefore, strive to prevent the formation of dust by all possible means, especially by removing the screens as far as is practicable from the downcast shaft, by spraying the tops of full tubs of coal, particularly just before they are pushed into the cage, by periodically removing dust from dusty sections, and by whitewashing the main haulage raods.

In contesting against firedamp, colliery engineers should endeavor to learn as accurately as possible, by frequently repeated determinations for firedamp, the nature of their mines with respect to the amount of gas emitted, so that they can determine the risk of gas explosions.

Similar steps are needed in combating the dust danger, it being advisable to carry out tests to find the total quantity of dust present in different parts of the mine, and also what proportion will pass through a 190-mesh screen, both figures being stated per cubic meter of air. Account should also be taken of the quantity of stone dust mixed with the coal dust. By comparing the results so obtained with the limiting conditions stated above, engineers will be able to ascertain where the gravest danger lies—in other words, where there is most need of precautionary measures, such as the application of water or stone dust.

Swedish Railways Abandon The Use of Peat

The kingdom of Sweden is well supplied with peat, but has practically no coal, so it was thought that the substitution of peat for fuel would result in a considerable saving. The experiment was tried on the Swedish railways with the result that the engineers estimated a loss of $1.84 per ton of peat as compared with coal—a ton of coal containing as much heating power as 1.64 tons of prepared peat. As a result of these tests, the use of peat has been discontinued.

PERSONAL

Mining and metalurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

T. Lane Carter, of Chicago, is inspecting mines in Arizona.

Prof. Robert H. Richards, of Boston, was in New York last week on business.

John H. Adams, vice-president of the Sayre Mining and Manufacturing Company, Birmingham, Ala., has resigned.

James McDonald has been appointed western manager of the Pittsburg Coal Company, with headquarters in Chicago.

George H. Playter has resigned active management of the United Zinc Company, Joplin, Mo., to attend to private interests.

George B. Ramsey has resigned as general manager of the Allegheny River Mining Company, which owns coal mines in western Pennsylvania.

Edgar A. Collins, superintendent of the Montana-Tonopah Mining Company, has opened an office at No. 300 First National Bank building, San Francisco.

F. W. Nobs has resigned his position with the Santa Maria (Mexico) Mines, Ltd., and will engage in mining in Nicaragua. His address is at Leon, Nicaragua.

A. P. Seymour, manager of the Cobalt Lake mine, has resigned and will shortly make a trip to England. He is succeeded by M. R. B. Gordon, of the Little Nipissing mine.

Grant B. Shipley, formerly engineer of mining and timber-preserving machinery for the Allis-Chalmers Company, is now president of the Pittsburg Wood Preserving Company.

H. J. Wallace, recently with the International Smelting Company at Tooele, Utah, is now engineer in charge of construction work for the Mason Valley Mines Company, at Wabuska, Nevada.

J. M. Macoun, of the Canadian Geological Survey, who, with his party of 14 was wrecked last September in a gale off Wager inlet, Hudson Bay, and given up for lost, has arrived safely at Fort Churchill.

Draper & Gross have removed their offices to 745 Equitable building, Denver, Colo. Mr. Draper is now in California on professional business. Mr. Gross has returned from Sonora, Mexico, and will soon leave for San Juan district, in Colorado.

S. G. Blaylock, formerly metallurgist of the Trail works of the Consolidated Mining and Smelting Company, of Canada, and later superintendent of the St. Eugene mine, at Moyie, B. C., has been appointed assistant general manager of the company.

S. W. Eccles, vice-president of the American Smelting and Refining Company, has been chosen president of Kennicott Mines Company, of Alaska. He has also been chosen president of the New River Collieries Company, of West Virginia. Mr. Eccles is at present inspecting the Guggenheim mines in Mexico.

Ralph Nichols is president of the "Latest Out" Mining and Smelting Company, of Gilmore, Lemhi county, Idaho. This company is developing a deposit of lead-silver ore in the same region as the Viola mine, which in the '80s, was famous under Mr. Nichols' management. His new venture is promising to turn out well.

Vice-president J. F. Taylor, of the Lake Superior Corporation, Sault Ste. Marie, Ont., has been appointed general manager and W. C. Franz has been made vice-president with charge of transportation interests. Consulting Engineer Ernst becomes general manager of the Algoma Steel Company, with C. E. Duncan as general superintendent.

OBITUARY

Charles J. Hughes, United States senator from Colorado, died at Denver, Jan. 11, aged 57 years. He was born in Missouri, educated as a lawyer and removed to Denver in 1877. He became an expert in mining law, and was engaged in many important mining cases. From 1903 till 1906 he was professor of mining law at Harvard University. He was elected senator in 1909.

James Blick died at Crafton, Penn., Jan. 4. He was born in England and as a boy worked in mines there. About 35 years ago he came to this country and began work in coal mines in the Pittsburg district in Pennsylvania. He rose gradually to be foreman and superintendent, and in 1891 was appointed district inspector of mines, a position which he had held ever since. He suggested many improvements and was the first of the mining officials of the Commonwealth to call attention to the dangers incident to the drilling of oil and gas wells through coal seams adjacent to mines.

Charles Hill Morgan, one of the best known iron and steel engineers, died at Worcester, Mass., Jan. 10, aged 80. His achievements as a mechanical engineer had brought distinction in many countries; his inventions and improvements of steel-works machinery, especially in wire manufacture, are used throughout the world. He was born in Rochester, N. Y., and as a boy he worked in a mill at Clinton, Mass., and when still a youth perfected notable inventions. In 1864 he was made superintendent of the Washburn & Moen wire mills at Worcester and held that position for many years. About 1881 he took up consulting work, and was president of the Morgan Construction Company and Morgan Spring Company, Worcester. In 1899, he was elected president of the American Society of Mechanical Engineers. He was one of the founders and for 40 years trustee of Worcester Polytechnic Institute. In 1893 he was one of the Board of Judges of the Exposition at Chicago. He was a member of the American Institute of Mining Engineers, the Iron and Steel Institute, and the Engineers' Club of New York.

Edward Kerry McCan died at Phœnix, Ariz., Oct. 29, aged 42 years. He was born May 23, 1868, at Tralee, county Kerry, Ireland. At the age of 16 he came to America and accepted a position in the office of the Omaha & Grant Smelting Company at Omaha, where he worked for two years, after which he was sent to Velardeña, Durango, by E. W. Nash, who put him in charge of all stores and warehouses at that place. After the sale of these properties to the American Smelters' Securities Company, Mr. McCan was made assistant manager, in which position he remained for one year. He was then sent to the Braden Copper Company in Chile as assistant manager, where he remained for four years. During this time he was taken down with consumption and went to Arosa, Switzerland, but gaining no relief there he returned to Mexico but only to remain for six months, after which he went to Phœnix, Ariz., where he remained one year before passing away. He was well known to many mining men in Mexico and was universally liked and esteemed. During his long illness he was much missed, but many of his friends were not aware that he was in Arizona. He was unusually successful in handling Mexican and Chilean laborers. He was a member of the American Institute of Mining Engineers for six years past.

SOCIETIES and TECHNICAL SCHOOLS

Mining and Metallurgical Society—The annual meeting was held at the Engineers' Club, New York, Tuesday, January 10. Dr. H. M. Chance presided, J. Parke Channing, the president, being in Mexico. The afternoon was devoted to business matters. In the evening there was a dinner, followed by some addresses on technical subjects, S. J. Jennings, Prof. A. L. Walker, Prof. R. H. Richards, S. H. Chauvenet and A. R. Townsend being the speakers. The following officers were elected for 1911: President, J. Parke Channing; vice-presidents, F. W. Bradley and C. W. Goodale; secretary, W. R. Ingalls; treasurer, B. B. Lawrence; executive committee, Messrs. Channing, Chance, Ingalls, Lawrence and Richards. At a meeting of the New York section, on the same date, George C. Stone was elected chairman, *vice* W. R. Ingalls, resigned.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

Denver

Jan. 31—As predicted in the JOURNAL of Dec. 10, the unwatering of the Cripple Creek mines has been, and will be, necessarily a slow process. No "underground lake" has been tapped, as forecasted by the daily papers, nor has the tunnel even cut what is known as the Black Belle watercourse, in Beacon hill. This being the case, a station has been cut west of the connection with the El Paso workings, and from this point a crosscut will be driven to what is called the C., K. & N. watercourse, which, it is said, flooded the El Paso mine five years ago.

Grading has been commenced at the Ajax mine, on Battle mountain, for the building of a 100-ton mill for the treatment of the old dumps of that property, the cost of the plant being estimated at $100,000. The Clancy electrochemical system will be used, and it is said that Mr. Clancy will supervise the erection and running of the mill. It is expected that the mill will be ready to run in July.

The heading of the long transportation tunnel, with its portal in Gold hill, just below the town of Cripple Creek, and its heading now under the Sheriff mine, on Raven hill, was first known as the Moffat-Bush tunnel; later as the Ophelia; and now having been purchased by Eastern people, as the Gold Exploration and Tunnel Company. It is reported that a reorganization is being effected, and that the tunnel will be driven eastward. The Ingham, Work, Doctor-Jack Pot, and other big producing veins will, it is said, be intesected, and there should thus be a big output from Raven hill during this year by the Gould Mining and Milling Company, which has been organized by J. M. Parfet, who originally superintended the driving of the tunnel. He purposes working the Rhinoceros and Nil Desperandum and other properties above mentioned under contract with the new tunnel company.

What was formerly known as the Vidler tunnel, and which had a rather unsavory reputation, is now known as the Argentine tunnel, of the Montezuma & Western railway, with Robert H. Dwyer as general manager of the railway, and General Manager Woodruff in charge of the tunnel. Since Sept. 1, when work was resumed on the tunnel, 1000 ft. are said to have been driven, leaving about 2000 ft. to be completed. The object is to connect with the Argentine Central railway at the Waldorf mines, above Georgetown, on the east, and to push the tunnel through to the western or Pacific side, when it expects to get the ores of the West Argentine and Montezuma district mines, in Summit county. These ores are chiefly silver-lead and zinc. It is reported that a 2-ft. vein of high-grade silver-lead ore has just been cut in driving the tunnel. The general manager of the Waldorf mines is E. J. Wilcox, who was also the projector and builder of the Argentine Central railway, which connects with the Colorado & Southern at Silver Plume. The Waldorf mines are now being extensively worked and sampled for possible purchasers, by Arthur Lakes, Jr. There are about eight miles of workings, and extensive bodies of low-grade silver-lead and copper ores developed.

Butte

Jan. 12—At the annual meeting of stockholders of the Ohio Keating Gold Mining Company, held in Butte recently, the following were elected directors: R. M. Calkins, of Seattle, George M. Bourquin, W. H. Penfield, C. H. Smith and J. E. Oppenheimer, of Butte. An increase in the number of shares from 500,000 to 800,000 was also authorized as well as a bond issue of $50,000. By means of the bond issue it is hoped to put the company on a sound financial basis, paying off the present indebtedness and providing a working surplus.

A committee appointed by the legislature has been making an inspection of the Butte mines for the purpose of ascertaining just what legislation is needed for the better ventilation of the mines and the general improvement of sanitary conditions. While each year bills have been introduced providing for improvement in mine ventilation, yet nothing has, as yet, been passed which covers the situation in a comprehensive manner.

President A. B. Wolvin, of the Butte & Superior Mining Company, is now in Butte arranging for extensions in the payments on the original bond issues. He has made public what is probably the most authentic statement received regarding the finances of the company and declares himself well pleased with conditions. From July 1, to Dec. 31, 1910, the net earnings were $110,676, the net earnings during the last three months of the year averaging $25,000 per month.

The December output of Butte & Superior was 500 tons daily and this will shortly be increased to 600 tons. It is the company's intention to install additional equipment in both the mine and the Basin concentrator which will materially increase the efficiency and it is expected that the improvements will be completed by March 1. Mr. Wolvin states that all of the local bondholders have exhibited a willingness to give an extension of time on the bonds upon which payments were due Jan. 1, and that the company is now in a sound financial condition and has a substantial working surplus in its treasury.

Salt Lake City

Jan. 12—The Snake Creek tunnel was advanced 355 ft. during December, and on Jan. 2 was in 2423 ft. Owing to the holidays and power trouble, 13 shifts were lost during the month. The contractors believe that it will be possible to make nearly 500 ft. per month. The ditch is completed 2350 ft., and permanent ties and ventilating pipe are laid for over 2300 ft. Hard limestone beds with some quartzite have been cut. The ground breaks cleanly and stands well, the only timbering so far necessary having been three sets at one point, where there is some broken ground. The face is in blue limestone. The tunnel is 7x9 ft. in the clear, with a water ditch 3½x4 ft. No water has yet been encountered.

At a meeting of the Utah branch of the American Mining Congress, Jan. 9, it was decided to give a banquet in honor of John Dern, president of the national organization. The banquet will be held at the Commercial Club, Jan. 25. Committees on arrangements and invitations were appointed and 500 invitations will be sent to business men, mining men, engineers and others. Various questions of importance to the people of the State will be discussed. There will be a conference of the general officers of the congress.

Uranium ore is being mined near Cisco, in Grand county, on property under bond and lease to L. D. Gordon, of Salt Lake City. The ore, which consists largely of carnotite, occurs in sandstone in small lenses and stringers. Sorting is necessary. A shipment will be made to New York within the next two weeks. Much of the rock is interesting for specimens.

Deadwood, S. D.

Jan. 10—In the Black Hills district the gold production is steadily increasing, and money for prospecting and developing new ground is becoming more plentiful. The Wasp No. 2 mill, recently started, is now running at full capacity of 400 tons per day. Some trouble was at first experienced with iron pulleys on the rolls breaking near the hubs; wooden pulleys have been substituted. The Golden Reward company has just made definite announcement of a new body of ore which has been under course of development for six months past in the southeasterly portion of the property, having been opened from the Mikado and Union shafts. The development at present shows a length of 1100 ft., with the extremities as yet undetermined. The first crosscut showed a width of 60 ft., the second 80 and the third 135 ft.; the fourth is advanced 80 ft. in ore and the walls not in sight. The orebody is 14 ft. thick at points where raises have been made, but all work lately has been confined to lateral exploration. The character of the ore is different from anything previously opened in the Bald Mountain section, running from 12 to 15 per cent. sulphur and about an equal amount of iron. It is easily roasted to an almost perfect cyaniding material. The company will erect a roaster, and either rebuild the present 200-ton cyanide mill, or erect a new plant, present plans contemplating the treatment of 300 to 500 tons per day. The Golden Reward company is largely controlled in New York, the officers being: Robert Goelet, president; Harris Franklin, vice-president; C. C. Tegethoff, secretary-treasurer; N. E. Franklin, assistant secretary; Henry Schnitzel, general manager. These gentlemen, with James A. Peabody, George G. Dewitt, August Belmont and W. B. Devereux, comprise the board of directors. The Golden Reward has been a big payer for years, and is maintaining a splendid output at its cyanide plant, and from shipments of smelting ores.

Sheriff's sale of the Hidden Fortune, which was to have been held on Jan. 3, to liquidate taxes and receiver's expenses, has been postponed to Feb. 4. Several persons are negotiating for the property, and it is more than probable that before the sale date a redemption will be made. J. D. Hardin has effected a deal whereby the Altia property has been freed from debt, and operations will be resumed.

Birmingham, Ala.

Jan. 15—Don H. Bacon, who was president of the Tennessee Coal, Iron and Railroad Company at one time, succeeding Nat Baxter, is in the Birmingham district looking over the properties of the Southern Iron and Steel Company. One statement is that he is to make an expert report and another view is that he has been asked to become president of the company.

Announcement is made that G. B. McCormack and Erskine Ramsay, who recently purchased the blast furnace, ore properties and other lands adjacent, at Cedartown, Ga., have made a lease to the Anniston Iron Company, allowing that company to work the ore lands.

Reports have been current that the Louisville & Nashville has placed an order for 72,000 tons of steel rails with the Tennessee Coal, Iron and Railroad Company.

Cobalt

Jan. 13—Dissatisfaction is being expressed in Porcupine over the failure of the Government to outline its railway policy on the branch line. So far no action has been taken with regard to the Government townsite, and in the meantime speculation is rife and the real-estate business is booming. This delay is, however, an injustice to the district as it it leads to the erection of cheap and flimsy buildings that may well prove fire traps. Good progress is being made with the building of the railroad, and there is now over half a mile of steel laid. Several of the large Cobalt companies are entering the district, and are taking up options on properties. Among these is the Crown Reserve, which holds options on several properties in the vicinity of the Timmins holdings. The Trethewey company has lately increased its capital a million dollars, with a view, it is stated, of securing outside properties.

Reports from Toronto state the Preston-East Dome Mines Company, Ltd., has been organized to acquire the Preston claim in Deloro township and the three Brydge-Ormsby claims in Tisdale township in the Porcupine mining division. This company has a capital of 3,000,000 shares, par value $1 each, 1,000,000 shares of which were placed in the treasury. A syndicate of Toronto brokers, headed by Messrs. Playfair, Martens & Co. and A. E. Osler & Co., has underwritten a block of this stock. Little development work has been done on the Preston claim but 26 veins, carrying free gold, are reported to have been uncovered. The Brydge-Ormsby properties adjoin the Dome mines on the southeast. Development work on this property has consisted of surface trenching, which has opened up a number of promising bodies of gold-bearing quartz.

Owing to an accident to the power plant at Ragged Chutes, several of the Cobalt mines have had to start up their compressor plants again. The accident was caused by a back rush of air which blew off the two steel heads over the shafts. The delay is a serious matter to some of the smaller properties that are not equipped with compressor plants.

A report is being circulated that the Grand Trunk is endeavoring either to purchase or lease the Temiskaming & Northern Ontario Railway, in order to have direct connection with the Grand Trunk Pacific from Toronto. The matter is of great interest to people in northern Ontario as the service of the former has always been most unsatisfactory. The high freight rates and telegraph and telephone tolls, coupled with the fact that the company is not under the jurisdiction of the railway commission, and that legal redress cannot be enforced in case of damage or accidents, would make the change quite welcome.

Johannesburg

Dec. 10—I have already referred to efforts being made to find a satisfactory locomotive for underground traction on the Rand. A specially designed 16-h.p. petrol locomotive made by the German firm, Gas Motoren Fabric-Deutz, is giving good results on the Crown mines. It has two speeds forward and reverse.

The annual report of the Wolhuter mine, which is the outcrop mine to the City Deep, shows that higher-grade ore is being developed in the lower levels. Ferreira Deep, in its annual report, states that 58,578 tons of sand were sent down for filling between June and December, 1910, which has helped to overcome the troubles recently experienced in the shaft and workings, owing to the subsidences of the hanging-wall; 364,174 tons were milled in 1909-1910, the cost per ton being 18s. 10.9d.; value per ton, £2 7d. 11.6d.; profit per ton, £1 9s. 0.6d.; total profit, £537,174 9s. 4d. Ore reserves were 1,799,328 tons of an average value of 9.6 dwt. gold. In the Jubilee, Village Main Reef, Village Deep and Turf mines, the main reef series has been opened continuously along the dip for 7570 feet.

The November output of the Globe & Phœnix mine, in Rhodesia was £72,152 from 5252 tons milled. The Giant mines crushed 10,320 tons for a yield of £19,069 or 37s. per ton, expenses being 16s. per ton. The Eldorado mine last year crushed 80,566 tons, yielding gold valued at £195,214 at a profit of £107,203. On the fourth level 912 ft. of reef averaged 18.2 dwt. over 6 ft. On the fifth level 1073 ft. of reef exposed gave 23 dwt. over 6 ft. The Cam and Motor mine has 350,000 tons of ore averaging 11 dwt. gold developed. The Jumbo mine has produced since 1904, 80,000 oz. gold of a value of £340,679 and has 40,000 tons of ore averaging 10.3 dwt. gold developed. The present rate of output of gold in Rhodesia does not represent the true potentialities of the country as a gold producer. Many properties which have been worked on a small scale have now been shut down for extensive development and in 1912 Rhodesia will take a prominent place as a gold producer.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

At the Bonanza mines the structure for the concentrator to handle the low-grade copper ores has been finished, and machinery will be shipped within a few months. By the time the entire railroad is ready, the concentrator will be in position to make shipments. Copper ore assaying over 65 per cent., of which more than 100,000 tons is blocked out, will be shipped to Cordova by the railroad, and thence to the smeltery at Tacoma by boat. This grade of copper ore assays 13½ oz. of silver per ton. The American Smelters Securities' smelting and refining plant at Tacoma is being enlarged to handle the output of the Beatson and Bonanza mines, and can turn out 40,000,000 lb. of copper in 1911.

Alaska-Treadwell—It is stated that contract with the Tacoma smeltery requires three months notice before the cessation of shipments of concentrates so the cyanide plant will not treat the sulphurets from the Douglas Island mines until this time has elapsed.

Copper River Railroad—The Copper River & Northwestern Railroad will extend its railroad toward Fairbanks, in the Tanana gold district, 300 miles, at a cost of $30,000,000. Grading has been completed to the Bonanza mines at Kennecott, 197 miles from the Cordova terminus. Tracks have been laid for 150 miles, and 160 miles will be completed by Jan. 1. The last steel structure, a bridge over the Kuskulana river, 240 ft. above water, is in place, and remaining gaps along the right of way will be bridged by trestles. All trackage is expected to be completed by April 1, 1911. Through mail and passenger service has been in operation some time from the mouth of the Chitina river to Chitina, 132 miles. From Chitina the trip to Fairbanks is continued by wagon or sleigh over Government trail. The proposed 55-mile extension to the Behring coalfields is not likely to be pushed until title to the coal fields has been finally decided.

Arizona

Cochise County

Calumet & Arizona-Superior & Pittsburg—The merger of these companies is proposed for April 1. Calumet & Arizona capitalization is to be increased to 650,000 shares of $10 each, one share of new stock to be exchanged for 3½ shares of Superior & Pittsburg. If 50 per cent. of the latter stock is deposited for exchange before April 1 a dividend of 2 1/7 times those paid by Calumet & Arizona between Aug. 15, 1910 and April 1, 1911 will be declared by the directors of the Superior & Pittsburg. An official of the Calumet & Arizona company is quoted as saying: "Irish Mag shaft has 29,830 tons of oxide ore, assaying 11.26 per cent., which will yield 6,720,000 lb. of copper. This is in new territory, entirely different from where they have been mining for the past six years. The Oliver mine has ore developed amounting to 647,000 tons, assaying 5.21 per cent., representing over 67,000,000 lb. of copper. This represents new developments, and is as great as at any time during the past six years. In addition to these, other parts of the property show considerable bodies of ore, running from 4 to 6 per cent. copper and are in ground which has not previously been explored. These workings will probably produce alone sufficient tonnage for the current year's work. Calumet & Arizona and Superior & Pittsburg combined can produce copper at under 7c. per lb., and if work be confined exclusively to the rich ore deposits running from 10 to 15 per cent., there is enough ore developed to run for four years at a production cost per pound of copper of less than 5 cents."

Graham County

Arizona Copper Company—This company has decided to increase its milling capacity from 800 to 1500 tons daily. The addition will enable the company to treat a larger quantity of low-grade ore, rather than to double the present production of copper.

California

Fresno County

Creme Petroleum—A 400-bbl. gusher has been developed at well No. 1 which was completed in November.

Guaranty Oil—The recently acquired St. Elmo 60-acre property in the Coalinga fields brings the total holdings to 1220 acres. The St. Elmo property has seven producing wells on it. On the lands in the Midway field two derricks are nearing completion.

Inyo County

Hudson—A lead-silver strike is reported on this claim at Madero—renamed from Vilareal.

Nevada County

Sultana—This group, comprising the Prescott Hill, Sultana, Houston Hill and others, at Grass Valley, has been secured by men believed to be associated with the Empire company.

Red Ledge—Arrangements are being made by Idaho men to whom this property at Washington has been bonded, for the driving of a lower adit tunnel.

Shasta County

Uncle Sam—The Big Seven Consolidated Mining Company is reported to have bonded at $60,000 this mine, six miles west of Kennett. A 10-stamp mill was recently completed and contracts signed for the delivery of electric power at the plant.

Noble Electric Steel—The Heroult iron smeltery has resumed operations and is said to be producing 15 to 20 tons of pig iron per day.

Sierra County

Last Resort—Rich sulphurets are being taken from this claim, near Downieville, owned by Jason Frye.

Larabee—This gravel claim on South Fork is being opened up by Reno men. W. O. Frost is manager.

Forest—Gravel that runs $1.25 per car is being taken from the South Fork claim, at Downieville.

Ante Up—Rich rock showing much free gold has just been encountered in this property on Woodruff creek. Horace Morse has charge.

Tightner—A shipment of 300 lb. of bullion, valued at over $50,000, has just been made from this mine at Alleghany to the mint. The gold was recovered from 1200 lb. of specimen ore, recently worked in the Red Star mill. Over 400 oz. of concentrates were saved, which Mr. Johnson, the owner, claims are worth $12 per oz.

Siskiyou County

Mono—This mine, near Kreka, was recently sold to Chicago interests, for a price stated as $100,000. The main vein is opened for a total length of 500 ft. and to a depth of 550 ft. There is a nine-stamp mill on the property.

Tuolumne County

Santa Ysabel—The bond for the transfer of this property, near Tuolumne, is stated to call for the performance of 800 ft. of sinking and 1000 ft. of driving within two years.

Colorado

Clear Creek County

Gambetta—This mine, on Republican mountain, owned by the Joplin company, has received returns from a car of zinc ore that gave $36 per ton. The shoot is 30 in. wide, and 100 ft. in length.

Little Giant—Shipments from this mine, on Red Elephant mountain, returned 400 oz. silver per ton; Widetich & Co., lessees.

Seaton—This property, operated through the Newhouse tunnel, is shipping $25 ore to the Newton mill.

Cashier—During the week ended Jan. 7, this company shipped three lots of ore, which gave respectively 5 oz., 4½ oz. and 14 oz. gold, with some silver and copper.

Gilpin-Eureka—A three-days' run of this company's mill resulted in a gold retort of 62 oz.

Lake County—Leadville

Lime—This property, in California gulch, is under lease to the Iron Silver Mining Company, and will probably be reopened at an early date. Work was suspended awaiting contracts for the shipment of the zinc ore which was found of too low grade to ship at the present minimum price quoted by the smelteries.

Garbutt—This Breece Hill mine is daily shipping 75 tons of sulphides running $25 per ton. The shaft is to be sunk another 100 ft. in the near future.

Matchless—Work is advancing satisfactorily on the shaft of this property. Shipping will be resumed. The shaft was burned and caved for about 200 ft. a month ago.

La Plata County

Manager Gilbert, of the Durango plant of the American Smelting and Refining Company, gives the receipts at the smeltery for 1910 at: Gold, 33,772 oz.; silver, 854,861 oz.; lead, 6,068,510 lb.; copper, 508,033 pounds.

Park County

It is stated that the Colorado Gold Mining and Smelting Company, smeltery at Alma, completed six months ago, has been running successfully ever since with a capacity of 150 tons per diem, the ore coming chiefly from the Atlantic and Kentucky Belle mines. It is now reported that a company, backed by Joseph M. Scott, of the Scott Bond and Mortgage Company, of New York, is to build a 50-ton smeltery near Alma, to treat the output of the Morse mine.

Pitkin County

Hunter Creek—It is announced that D. R. C. Brown has leased this mill to Axel Johnson and associates, who are preparing to resume operations and that arrangements have been made with leasers for the treatment of their low-grade ores.

San Juan Region

The Hercules, Silver Ledge, Intersection, North Star and Shenandoah are continuing production. Development work is being done by the Bagley tunnel, Frank Hough, Gold King, Columbus, Vermillion, Hamlet, Gold Bug, Hoosier City and others.

Iowa-Tiger—This mine, in the Silverton district, which was in almost constant operation throughout 1910, shipped 400 tons of concentrates in December last; value about $60 per ton.

Alta—Production is being maintained from this property.

Summit County

Colorado-Toledo—A 100-ton mill is being erected for operation about March 1.

Teller County

Elkton—The water is lowering at the rate of two feet per week, and a hoist is now being installed on the ninth, or bottom, level, and the shaft will be sunk another lift at once.

El Paso—It is stated that the 700 and 800 levels have been unwatered, and that the water in the shaft is 100 ft. below the 800 level; and that all properties belonging to the company have been largely benefited by the deep drainage tunnel.

Maggie—This property, on Raven hill, is making a big showing. Carl Johnson, leaser, will commence regular shipments.

Stratton Estate—The American Eagles, after suspending work for two weeks to put in a new cable, is now hoisting again, and it is stated that 20 subleasers of the Colorado Mines and Investment Company, are working in ore.

Ajax—This mine, on Battle mountain, is shipping about 55 cars per month.

Isabella—The Western Investment Company, leasers on the Empire State, of this company, shipped 400 tons of ore in December, said to run about $20 per ton, and from the Ophir 330 tons of mill ore. It is stated that the output of the Isabella Mines Company, on Bull hill, will approximate 1200 tons for December, with an average of 1 oz. gold per ton.

Victor—Sublessees from the Western Investment Company are said to be making regular shipments from the 200 level. A new shoot of 1-oz. gold ore has been opened.

Mary McKinney—The Western Investment Company, lessee, shipped 808 cars in December, value $25 per ton. The Mary McKinney company took over the mine Jan. 6.

Mabel M.—This mine, on Beacon hill, will now be worked by 20 sets of leasers, as the shaft has been repaired. Development work will be carried on by the company.

Vindicator—Two cages are now being used in the mine, and three machines have been put to work on the 10th level.

Idaho

Coeur d'Alene District

Stewart—The mine in Government gulch is temporarily closed owing to weather conditions.

Pittsburg Lead—S. L. Shonts and Oscar Nordquist have arranged to take a two-year working lease on the mine.

Marsh—The company has obtained a one and one-half year lease on the mill of the Pittsburg Lead company, the lease giving the right to use the mill three out of every four weeks. About April 1 the mill will be started, after which time the Marsh should ship approximately 500 tons of lead-silver concentrates monthly.

Wonderful—Six feet of copper ore have been opened up in the drift which followed a stringer for 100 feet.

Snow Storm—The lode is claimed to have been found below and to the south of the big fault.

Lemhi County

Italian—At 100 ft. the shaft is in high-grade ore. The Leesburg Mining Company owns this property 20 miles from Salmon City; D. B. O'Brien, manager.

Nez Perce County

Wild Rose—It is reported that the Ozark Mining and Milling Company, owners, will equip this property in the Pierce City district with a 200-ton concentrating and cyanide plant. Ore from the Ozark mine, two miles distant, which is also owned by the same company, will be treated in this plant. George S. Bailey and associates, of Spokane, are said to control the company.

Kansas

Cherokee County

Peacock-Galena—The 250-ton mill, brought from the old North Cut mine at Peacock, is operating on a 12-acre lease on Short creek, northeast of Galena cemetery. Three of the five shafts are in working condition. Ore is encountered at a depth of 75 to 122 feet.

Kentucky

Knox County

Anchor Coal Company—This company will soon be ready to ship coal from its mine at Anchor, on the new Tye Fork branch of the Cumberland railroad.

Interstate Coal Company—This company has leased the property of the Tye Fork Coal Company, and has begun work.

Whitley County

Jewel Jellico Coal Company—Progress is being made on the new mine and plant at Wofford, which will have a capacity of 1000 tons a day.

Mount Morgan Coal Company—The plant, near Williamsburg, is being repaired, and work in the mine has been started, after a stoppage of 14 months.

Michigan

COPPER

Lake—This company has placed an order with the Nordberg company, of Milwaukee, for a double conical-drum hoisting engine capable of handling a load of about 10 tons from a depth of 5000 ft. The order for the combination steam-and-air hoist originally ordered by this company has been transferred to the Franklin. The erection of the air compressor is progressing satisfactorily and when it goes into commission additional drills will be started and active work on the new shaft will be pushed.

Gratiot—Rock shipment to the Allouez-Centennial mill has been discontinued.

Mass—A crosscut from the fifth level of its C shaft on the Butler lode to the Evergreen lode, a distance of about 400 ft., has been started.

South Lake—No. 8 drill hole has reached the No. 2 South Lake lode and shows it to be about 18 ft. wide and carrying a fair amount of copper. This hole was put down in about the center of the tract and the results obtained corresponded with those obtained in the previous holes.

Michigan—All development work on the Bee tract has been stopped and the only work that is being done at the property is diamond drilling; two outfits are in operation at the southern portion, completing a cross-section of the land. About 60 men were laid off by this shutdown.

Ahmeek—No. 4 shaft has reached the Kearsarge lode which at the point of contact is well charged with copper. No. 3 shaft is sinking within a short distance of the lode.

Copper Range—At the Champion stamp mill it has been necessary to suspend operations temporarily owing to the intake main in Lake Superior becoming clogged by sand. Average rock shipments were maintained, ore being treated in the Baltic and Trimountain stamps.

Calumet & Hecla—At the No. 15 shaft on the Osceola lode an electrically driven air compressor to act as a booster from the main compressor plant has been started. Experiments with various types of rock drills are being conducted. This company is drilling on the St. Louis tract.

Atlantic—It is understood that the company will recommence opening the old Atlantic mine, as the development on the Baltic lode in Sec. 16 of the Atlantic property proved disappointing after an expenditure of about $350,000 in three years.

IRON-MARQUETTE RANGE

Cleveland Cliffs Iron Company—This company has made a contract with the City of Negaunee under which it acquires the right to remove the iron ore under the Baldwin-Kiln and Cemetery tracts, owned by the city. The ore will be taken out through a tunnel to be run from the Maas shaft.

Maas—Hoisting has been suspended at this mine at Negaunee. The upper portion of the shaft is being given a thick lining of concrete. The New York Foundation Company is doing the work. The concrete will be put down outside of the present timber and to a depth of 178 ft. The shaft is bottomed at 1100 ft. The Maas shaft is to be walled with concrete from surface to the ledge because for that distance it was sunk through very treacherous ground and it lacks stability. It is believed that it will take at least six months to finish the work planned, and hoisting will not be resumed until some time after navigation opens.

Portland—This open-pit mine in the Michigamme district is out of commission until next spring. The Portland is controlled by the Rogers-Brown interests and is operated under contract by the Hoose & Person Construction Company of Iron Mountain. During last season about 80,000 tons of ore were mined and a considerable area was stripped.

IRON-MENOMINEE RANGE

Riverton—The Brule Mining Company has secured control of this old mine, formerly owned by the Oliver Iron Company, and will explore part of the tract, which adjoins its Chatham mine.

Youngs—The Huron Mining Company, which owns this mine in the Palatka district, is cutting down its force, and will keep only a few men busy on exploration work. There are 40,000 tons of ore in the stock pile and a larger quantity broken in the mine and ready to hoist.

Minnesota

IRON-VERMILLION RANGE

The latest exploration work is being carried on by E. C. Kennedy, of Duluth, on the Asa Camp property, near Ely. Test pits are being sunk, and it is said that the indications of iron are good.

Missouri

JASPER COUNTY

Baker & Relling—This 400-ton mill, on the old Victor lease of Connor land south of Webb City, has started operations.

Webb City Smeltery—This plant has been completed and has begun the production of pig lead.

Falls City—The 300-ton mill at this mine on the Taylor and Glover land, west of Joplin, is nearly completed.

Granby—A mill run of about 200 tons of the dirt from the new Smelter Hill mine has been made to determine if the ore is a grade to warrant the erection of a mill.

Tri City—The mill is being repaired and it is reported that a shaft will be sunk at this Carthage property.

Montana

BUTTE DISTRICT

On Jan 14 fire broke out in the new workings between the Modoc and Butte-Ballaklava mines filling connecting workings of adjoining mines with smoke and gas and causing the death of one man in the High Ore and one in the Bell mine. It has been necessary to shut down the Diamond, Bell, High Ore, Speculator, Butte-Ballaklava and Gray Rock mines. The Anaconda hill mines are drained through the High Ore so all will have to be closed unless the fire is controlled quickly.

North Butte—Development work is being kept ahead of production which now amounts to about 1200 tons of ore daily. Mining is being conducted at a depth of 2300 feet.

East Butte—On the 800-ft. level of the Pittsmont the vein has been exposed for 1000 ft. and ore is being taken out three sets wide.

Pilot-Butte—The company was organized some time since with a capital of $1,000,000, par value of shares $10 each. The directors are Edward Hickey, William P. Jahn, J. J. Harrington, Patrick Sheehan, T. E. Murray, N. J. Bielenberg and J. W. Pratt. It is planned to take over the property of the old Pilot-Butte Copper Mining Company and sink the shaft, now 530 ft., to the 1000-ft. level before further development is begun. Many prominent stockholders of the Tuolumne company are interested.

Butte & Superior—The annual meeting of stockholders was held in Duluth, Jan. 10, with 75 per cent. of the stock represented. The financial statement showed that the company had earned $81,898 during the last six months of 1910. An announcement was made that a new contract with the Basin Reduction Company had been entered into whereby 30c. per ton will be saved on ore treatment. The following were elected directors: A. B. Wolvin, William White, I. Freimuth, Theodore Hollister, J. B. Becher, John G. Williams, J. F. Killorine, H. S. Clark and J. Bruce Kremer.

Anaconda—The foundations for the new sampling works, to replace that destroyed by fire, have been completed and the steel necessary for the building will arrive shortly. The building should be completed by spring.

Blue Bird—At a recent meeting the following were elected directors: E. P. Bradshaw and James S. Bradshaw, of Duluth, J. B. Foraker, of Cincinnati, and Alvin P. Nippen and Barton Mitchell, of Butte. The shaft is now down 200 ft. and will be sunk to a depth of 500. On the 200-ft. level a crosscut is being run to the vein. An electrically operated surface plant will be installed.

JEFFERSON COUNTY

Montana-Corbin—A petition in involuntary bankruptcy has recently been filed against the company by the following creditors: Butte Machinery Company, $632; Allen P. Bowie, $3000; William Gemmell, $28; and, W. D. Gibson, $700.

Wicks-Corbin Copper—Four feet of chalcopyrite and galena ore has recently been encountered in the east -west drift.

GRANITE COUNTY

In the Princeton district C. W. Tyrer has recently installed a steam hoist and compressor plant at the Northern Bell mine and mining will be begun shortly. The company in which he is interested has recently purchased the McGurk and Senty placer ground below Royal and has ordered a cyanide plant which will arrive in February and be used to work over the tailings now on the property. Henry Kroger has recently encountered good ore at the bottom of the shaft of the Silver Spray mine.

LINCOLN COUNTY

Libby Placer—Work has been started upon a contract to get out 100,000 ft. of logs for the mine. The placer has not been worked for two years, but is well equipped and will be operated in the spring.

Hazel T.—The company has recently been organized with the following board of directors: John H. Town and A. J. McCorkle, of Libby, and George Chandler, C. C. Upton and D. C. Cherrier, of Spokane. The Shaugnessy group of mines, situated eight miles south of Libby, were taken over and work began Jan. 2. A 10-ton electrically operated concentrator will be built.

Sylvanite—The machinery for a sawmill to be erected at Sylvanite has been brought out from Troy and when the mill is completed the work of rebuilding the surface plans of the various mines will be started.

MADISON COUNTY

Butte & Alder Gulch Exploration—A carload of gold ore has recently been shipped to the Washoe smeltery from the Nellie Bly mine, situated four miles southwest of Virginia City.

MISSOULA COUNTY

Butler Creek Coal Mining Company—A recent incorporation by Thomas Thibodeau and Fred Thibodeau, of Missoula, and J. J. Bounting, of Desmet, with a capital of $500,000: The property is situated just north of Desmet. New machinery will be purchased.

YELLOWSTONE COUNTY

Rebublic Coal—After a shutdown of 10 days, caused by a walkout of the miners, work was resumed on Jan. 4. The difficulties between the company and the men will be arbitrated.

Nevada

CHURCHILL COUNTY

Nevada Hills—Work on the 100-ton mill is progressing. Pending the completion of arrangements to bring in electric power from Truckee, underground development has stopped, owing to the insufficient pump capacity. George Wingfield controls the company; 1,000,000 shares, par value $5, out of a total of 1,250,000, are outstanding.

ESMERALDA COUNTY

Grizzly Bear—The Goldfield Consolidated company has refused to renew the lease and work has been stopped and the ground surrendered after the expenditure of about $75,000.

Red Top Extension—Shipments from this Goldfield property to the chlorination works are said to amount to 25 tons per day. The 475-ft. level is being extended to exploit the orebody.

ELKO COUNTY

Pavlak—A strike is reported on the Taft vein, near the Lily end line, at a depth of 150 ft. The orebody is said to be 40 ft. wide. Several Jarbidge companies are contemplating the erection of stamp mills in the spring.

NYE COUNTY

Big Four—The shaft on the Steen, Poak & Chapman lease at Manhattan is being sunk. Superintendent Cicala is fourth owner according to recent court decision.

McNeill—This Manhattan mill is operating steadily.

War Eagle—Ores from the Consolidated company's leases and tailings from the Cañon mill are being treated in this mill at Manhattan.

Union No. 9—On the 50-ft. level of the Heywood-Martinson lease at Manhattan 6 ft. of ore shows in the face. The shaft is down 75 feet.

Montgomery-Shoshone—The mill is still being operated on ore from the "glory hole" according to late reports from Rhyolite.

NYE COUNTY—TONOPAH

Ore shipments for the week ended Jan. 7 were: Tonopah Mining, 3300 tons; Belmont, 2450; Montana-Tonopah, 845; Tonopah-Extension, 980; MacNamara, 100; West End, 350; Midway, 50; total, 8075 tons; estimated value, $201,875.

Mac Namara—The hoisting cable has been repaired and operations resumed. Stoping is being done on four levels.

Tonopah Extension—The December clean-up amounted to about $44,000. Extraction of ore continues on the 270-, 400-, 500- and 600-ft. levels.

Montana-Tonopah—In December 41 bars of bullion and about 1000 tons of concentrates were shipped.

Tonopah-Liberty—The third shipment to Selby since the completion of the mill was made last week from this Liberty mine. Production is estimated to be about $25,000 per month.

WHITE PINE COUNTY

United States Tungsten—E. L. Fletcher, general manager, is stated to be conducting development work at the mines at Hub. The company is capitalized at $1,000,000 under laws of Delaware. Property on Williams creek, south of Mt. Wheeler, and in the Regan district are controlled by the company, of which O. A. Turner is president.

Boston-Ely—A recent accident to the hoisting plant at the Emma shaft caused a temporary suspension of operations.

New Mexico

SOCORRO COUNTY

Socorro Mines—From 20 to 25 stamps are dropping at the mill. The three-compartment shaft is being sunk 140 ft. deeper.

Gold Dust—The shaft is down 80 ft. and drifts extended 150 ft. from the tunnel.

Mogollon Gold and Copper—According to reports development continues in the East vein in the Cooney mine and in the Little Charlie east drift, the latter in milling ore.

Tennessee

It is announced that the Pratt Coal Company, of Birmingham, Ala.—the largest coal operator in Alabama outside of the iron companies—has secured options on about 30,000 acres of coal land. The lands are in the Cumberland mountains, between Tracy City and Whitwell, and are accessible by railroad.

Durham Coal and Iron Company—This new company, capital $10,000,000, has arranged to purchase the properties of the Durham Coal and Coke Company, about 18 miles south of Chattanooga, and those of the Fox Coal, the Sale Creek Coal and Coke, the New Soddy Coal, and the Hamilton Coal companies; also the coal properties of the Chattanooga Company, Ltd., on Walden's Ridge, from 18 to 35 miles north of Chattanooga. The Durham tract includes about 8000 acres on the Central of Georgia Railway, and the larger tract, about 58,000 acres of coal land, located on the Queen & Crescent line. These properties at the present time are producing about 500,000 tons of coal, but it is proposed to reopen the Sale Creek and Greysville mines, increasing producing capacity to about 1,000,000 tons yearly. New York, Baltimore and London people are interested. The offices of the new company are at Chattanooga. The officers are: Charles B. Eddy, president; Robert Pettigrew, general superintendent; W. T. James, chief engineer; Max Milligan, treasurer; T. K. Jenkins, purchasing agent; J. L. Davies, manager of sales.

Utah

Beaver County

The machinery for the pumping plant which is to furnish water for the mines in the Star district has been received, and the plant will soon be in operation. The waterworks system is controlled by the Matt Cullen and Red Warrior interests, and is incorporated under the name of the Western Pumping Company. The pipe line is about four miles long, and has a rise of 1800 feet.

Horn Silver—The work of installing new mill machinery is nearly completed, and it is expected that operations will be started early in February. A good tonnage of milling ore has been developed.

Cedar-Talisman — Drifting is being done on the 500 to cut the contact of limestone and quartzite northeast of the shaft. Operations in November and December were delayed as the power plant could not be used on account of lack of water. Development on the upper levels has opened a body of zinc ore, from which shipments have been made, and some silver-lead ore.

Galena—This property is in the Beaver Lake district, seven or eight miles northeast of Frisco. A vertical shaft has been sunk 80 ft., and cut 3 ft. of silver-lead ore. Drifting on ore is being done from the bottom of the shaft.

Nabob—Work is being done in this silver-lead mine, half a mile southwest of the Galena group.

Revenue—The middle tunnel recently cut silver-lead ore from 3 to 5 ft. in width. This has been opened for 25 feet.

Utah Mining, Milling and Transportation—Six cars of ore were shipped from the Lady Bryan claims in December. On the 300-ft. level soft carbonate ore 4 ft. in thickness carrying 20 to 96 oz. silver, 6 per cent. lead, some gold, and an excess of iron, has been opened 35 ft. in the west drift. On the 200 level ore has been followed 130 ft. on the strike.

Box Elder County

Susannah—Samples of rich ore carrying visible free gold have been received in Salt Lake from a recent strike. The property is being leased.

Planetary—A tunnel is being driven on the vein to make connections with the shaft at about the 325-ft. point. Some low-grade vein material has been opened, but no pay shoots developed. The Park Valley district is generally quiet, though considerable assessment work was done at the end of the year.

Juab County

The Eva and Nebo-Highland mining companies in the Mt. Nebo district, seven miles from Mono station, are doing active work. The latter company is expected to begin shipping in the spring. Lead-silver ore with some zinc is being developed.

A large number of locations were made on Jan. 1 in the north end of the district, and development work will probably be done during the coming year.

Iron Blossom—The ore under the cave has been opened 40 ft. Two sets 17 ft. long are in ore, which carries lead and silver with some gold. Much of the ore is soft and easily picked down. It is stated to ship about $54 a ton.

Sioux Consolidated—Ore on the 450-ft. level south and east of the shaft is reported to be continuing below the drift. There is still shipping ore available near the Colorado line.

Lower Mammoth—At the annual meeting Jan. 9, the following directors were elected: John Dern, W. S. McCornick, J. J. Stewart, M. P. Braffet, W. M. Havenor, A. T. Moon and D. L. Wertheimer. The financial statement showed total receipts, including cash on hand Jan. 1, 1910, and an overdraft of $10,044 Dec. 31, to have been $67,062. Ore sales amounted to $16,691. Assessments Nos. 23, 24, 25 and 26 were levied. Development on the 2000 looked promising, but so far the ore has been largely in bunches. Considerable work was done on the 1000 level, which produced shipping ore. There was 4420 ft. of development done during the year.

Piute County

Work is being done by leasers near Marysvale.

Cascade—A 3-ft. fissure vein carrying horn silver was recently cut in the incline 40 ft. below the 300-ft. level. This ore is being sorted and sacked.

Salt Lake County

Utah Consolidated—There are rumors to the effect that this company is negotiating to acquire the Bingham-New Haven.

Ohio Copper—The management reports the treatment of from 1800 to over 2000 tons of ore daily. The tailings are being impounded, and it is planned to conduct experiments with these at a later date. Progress is reported in equipping the third unit of the mill with Wall rolls, tables, etc. Eighteen additional tables sent from the Heinze mill, near Butte, have been installed in the first two units.

Sevier County

Southern Coal—Articles of incorporation have been prepared, ready for filing. The company proposes to acquire and develop coal land, and to market the product in southern Utah. Thomas Brown is president.

Summit County

Daly West—Royalties are understood to have been raised to a 50 per cent. basis. For the first 11 months of 1910 the Daly West shipped 53,540,025 lb. of ore, which is the largest output from Park City shippers. Development by the company on the lower levels has not been promising, but is being continued.

New York—A crosscut is being driven through black mineralized limestone on the 900 level to cut a large fissure opened above.

Uintah-Treasure Hill—Drifting on the 260-ft. level will be continued toward Silver King ground, to make connections with the latter company's 900, and later with the 700 and other levels.

Daly-Judge—Development is being done on the 1600 level recently freed from water. A part of it is badly caved, and it is proposed to bulkhead and drive around it, to reach that part of the ground in which ore was left standing at the time of flooding.

Little Bell— The mill is handling between 25 and 35 tons daily, operating one shift. A part of this ore comes from the second-class dumps, and the rest from the mine.

Tooele County

Utah Mine—Several cars of silver-lead ore have been shipped from Fish Springs. One lot of 28 tons brought $2291.

Washington

Ferry County

Mountain Lion—Walter E. Trent, of Los Angeles, has bonded this property in the Republic district from J. C. McLaren, of Ottawa. The mill will be remodeled.

Insurgent—The leasing company is shipping ore.

North San Poil—J. L. Harper has gained control of the San Poil and North San Poil properties at Republic.

Knob Hill—A compressor plant is being installed at this Republic mine.

Republic Mines—This company has gained control of the three and a fraction claims of the Morning Glory property in the Republic district.

Wisconsin

Zinc-Lead District

Shipments of ore from Platteville for the four weeks ended Dec. 31, 1910, were: Zinc ore, 14,256,090 lb.; lead ore, 1,227,130 lb.; sulphur ore, 3,599,110 lb. Totals for 1910 were: Zinc ore, 126,110,054; lead ore, 11,275,174 lb.; sulphur ore, 28,162,790 pounds.

Old Homestead—A 200-ton mill and roaster has been completed; R. A. Shepherd, Platteville, is manager.

Klar-Piquette—Option upon the mine and leasehold to 200 acres has been given to E. Voss at the purchase price of $150,000; 1400 ft. of Lawson Loop tramway has just been installed.

Cleveland—Foundations for a 100-ton mill have been completed, at Hazel Green, by the United Iron Works, of Joplin, Mo. S. W. Burford, Hazel Green, is general manager.

Canada

BRITISH COLUMBIA

Following are the shipments of the different mines in the Boundary district during the week ended Jan. 7: Granby, 24,659 tons; Mother Lode, 7298; Snowshoe, 2200; Rawhide, 4056; Jackpot, 444; Number Seven, 240; total, 38,897 tons. Smeltery treatments, Granby, 21,695 tons; British Columbia Copper, 14,645 tons.

Rawhide—The machine shop, blacksmith shop, office and supply store were burned, Jan. 3. Damage to the amount of $100,000 is partly covered by insurance. A shut-down of only 24 hours was necessitated. The British Columbia Copper Company took over the property from the New Dominion Copper Company last year.

ONTARIO

The shipments from Cobalt for the week ended Jan. 6 were: Nipissing, 281,200 lb.; Coniagas, 226,800; McKinley-Darragh, 143,460; Cobalt Lake, 131,400; Trethewey, 97,250; Temiskaming, 81,300; Townsite, 65,700; Beaver, 63,500; Buffalo, 63,100; La Rose, 62,300; Crown Reserve, 64,000; Kerr Lake, 60,300; Silver Cliff, 47,920; total, 1,388,230 pounds.

Bailey—Two good veins carrying silver have been struck at the 75-ft. level in this Cobalt mine.

Hudson Bay—A compressor plant will be installed on the property at Hangingstone lake, Gowganda. The mill on the Cobalt property is nearing completion and should be ready about the end of January.

Keeley—This South Lorrain property will now be developed as an asset of the Farmer's Bank, which failed a short time ago.

ONTARIO-PORCUPINE

Gold production in 1910 was from test mills at the Dome and Hollinger mines, operating more or less continuously for several months. Two stamps have recently been put in commission at the Vipond of the Porcupine Gold Mines Company.

Dome—It is stated that this company will put 100 cars of supplies into their property in Porcupine during the winter. They have built their own sidings and freight sheds at Kelso.

Pearl Lake Gold Mines, Ltd.—This company has been organized with Burr E. Cartwright as president, and P. W. Cashman, secretary, and an authorized capital of $2,500,000. It has four claims, adjoining the Hollinger, on which preliminary work is said to have disclosed 50 quartz veins, ranging from 2 to 30 ft. in width and showing free gold in places. In all, 15,000 ft. of trenching has been done and one shaft put down 35 ft.. A six-drill compressor plant is being installed.

Mexico

JALISCO

Navidad Reduction and Mines—A plant for direct cyaniding is in commission at the mines in the San Sebastian district. H. D. Gray, formerly of the Miami Copper Company, will make surveys and plans for a hydroelectric installation on the Ameca river. The company has held a power concession for several years.

Magistral-Ameca—The concentrating plant in the Ameca district has been shut down pending the installation of additional equipment sufficient to raise the capacity to 150 tons daily.

Bolaños—The Mexican Mines Company has acquired additional mineral land by denouncement, and now controls the Bolaños vein system for a distance of seven kilometers.

MEXICO

El Oro—The mill ran 31 days in December, crushing 30,380 tons that yielded $192,540. Working expenses were $95,250, development costs $22,550; profit on mine $74,740, on railway $10,000; total, $84,740; $1230 was spent on permanent improvements.

Mexico Mines—In December the mill ran 29 days, crushing 10,365 tons that yielded $115,950. Working expenses were $37,840, development $9900, profit $68,210.

OAXACA

San Francisco—The manager, E. W. Hockley, of this Taviche mine has resumed shipments, sending about three cars of sorted ore per month.

San Juan—About 20 cars per month are being shipped from this Taviche mine to the Aguascalientes smeltery.

Conejo Blanco—Hampson & Smith, owners of this Taviche mine, gave an option recently to George Houston, who started to work the mine, meanwhile negotiating the sale of his option to Bunau-Varilla. On Dec. 19, Houston struck rich ore. Monsieur Bunau-Varilla sold the French canal right at Panama to Douglas Robinson for the United States, and with his brother is the owner of *Le Matin*, the leading Paris morning paper.

SONORA

La Colorado—This company is arranging to enlarge its reduction plant at Minas Prietas.

Des Moines Development—Gold ore of good grade has been encountered on the holdings in the Altar district, and a mill to treat it will be erected.

El Tigre—Twenty-five stamps are to be added to this company's mill.

Santa Rosalia—Drifting has commenced on the 600-ft. level; 35 men are employed.

Elenita Mining—Work at the property of this company has temporarily ceased, after a visit of L. W. Powell, its principal owner, to the mine.

Cubana Mine—Copper ore has been found on the 200-ft. or bottom level.

Overmuller & Wilson—A hoist is set up over the main shaft on the property near Navojoa, and a 10-stamp mill will soon be installed.

TEPIC

Charles M. Becker and William W. Travell, Denver mining engineers, are erecting a small reduction plant at properties in the Ixtlan del Rio district.

Cuintla—This *antigua*, in the Rosamorada district, has been taken over by George F. Beveridge, of Los Angeles, Cal. Work now in progress will result in opening the orebodies below the old workings.

Central America

COSTA RICA

Montezuma Mines—In November the mill treated 3251 tons at an estimated profit of $18,430. Owing to the lack of water there has been insufficient power to operate more than 20 stamps and one tube mill, at the most. During December a survey was made of the line to the falls on the Barranca Guatusa river where it is proposed to build a power plant. About 10 headings were being driven: S. F. Shaw is general manager; mines office, Montezuma.

Australasia

WESTERN AUSTRALIA

Gold production in December is reported at 126,912 oz. For the full year the total was 1,595,263 oz. in 1909, and 1,470,632 oz.—or $30,397,964—in 1910; a decrease of 124,631 oz. last year.

NEW ZEALAND

Gold production in December is reported at 37,509 oz. For the year 1910 the total was 478,287 oz. bullion, equal to 446,481 oz. fine gold, or $9,228,762. This is a decrease of 38,698 oz., as compared with the previous year.

Asia

INDIA

The gold production of the Kolar goldfield in Mysore for the full year is reported at 541,998 oz. bullion in 1909, and 546,862 oz. in 1910; an increase of 4864 oz. The output of the two mines in the Dekkan—the Hutti Nizam and the North Anantipur—was 21,840 oz. in 1909, and 17,414 oz. in 1910. The total Indian production reported was 563,838 oz. bullion in 1909, and 564,276 oz. in 1910; an increase of 438 oz. only. The bullion reported in 1910 was equal to $10,497,218, or 507,848 oz. fine gold.

The Markets

Coal Trade Review

New York, Jan. 18—Coal trade in the West has been generally quiet. Steam coal demand is not heavy at present, but domestic coal has been stirred up a little by cold weather. The mines are generally busy, and apparently making out a good season. Car supply is hardly up to the mark yet, but is causing less trouble than it did a few weeks ago. At one or two consuming points there is complaint of a surplus of coal.

In the East the bituminous trade is quiet, almost dull, with few signs of improvement ahead. Anthracite trade is steady, with no special incident.

Pittsburg despatches report the taking of options on a large area of coal lands in Armstrong county, Penn., by a syndicate represented by W. W. Pollock, of Kittaning and R. T. M. McCready, of Pittsburg. This is said to be connected with the reported intention of the Delaware, Lackawanna & Western company to build a branch into the northwestern coalfield of Pennsylvania.

New Anthracite Line—It is again reported that a contract has been let for the extension of the Lehigh & New England road from Danielsville, Penn., to Tamaqua, 30 miles. This will give an outlet to New England over the Poughkeepsie Bridge line for that part of the Lehigh Coal and Navigation Company coal which is not covered by its standing contract with the Central Railroad of New Jersey.

Coal Traffic Notes

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, 12 months ended Dec. 31, short tons:

	1909.	1910.	Changes.
Anthracite	11,190,176	11,596,233	I. 406,057
Bituminous	38,882,058	41,497,912	I. 2,615,854
Coke	12,028,991	12,822,695	I. 793,904
Total	62,101,025	65,916,840	I. 3,815,815

The total increase last year over 1909 was 6.1 per cent.

Shipments of coal to Lake Erie ports for three years past are estimated as below, in short tons:

District:	1908.	1909.	1910.
Pittsburg	8,700,000	8,687,305	11,911,900
Ohio	3,600,000	3,002,815	4,297,300
West Virginia	3,450,000	3,874,570	6,629,500
Total	15,750,000	15,564,690	22,838,700

The 1910 shipments were the largest ever made. The increase over 1909 was 3,224,595 tons Pittsburg coal; 1,294,485 Ohio; 2,754,930 West Virginia; total, 7,274,010 tons.

Coal tonnage originating on the Southern Railway, 10 months ended Oct. 31 was: Tennessee district, 1,006,424; Alabama district, 2,558,369; total, 3,564,793 short tons, an increase of 491,573 tons over the previous year.

Coke production in the Connellsville and lower Connellsville regions, as compiled by the Connellsville *Courier*, was as follows for the year:

	Production.	Shipment.
Connellsville	10,883,483	11,379,384
Lower Connellsville	8,043,008	7,310,338
Total	18,926,491	18,689,722
Total, 1909		17,785,732

In 1910 there was an increase in shipments of 903,890 short tons, or 5.1 per cent. Of the production 11,420,100 tons were classed as furnace and 7,506,391 as merchant coke. The production exceeded the shipments by 236,769 tons.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

New York

Anthracite

Jan. 18—At this time of year New York is usually a weather market. As last week's mild, wet weather rather depressed sales, so this week's cold snap has improved them. Domestic buyers are prone to draw hasty conclusions as to what the rest of the winter will be.

Schedule prices for domestic sizes are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut, all f.o.b. New York harbor. For steam sizes current quotations are $3@3.25 for pea, $2.30@2.75 for buckwheat, $1.85@2.15 for No. 2 buckwheat or rice; $1.35@1.50 for barley; all according to quality, f.o.b. New York harbor.

Bituminous

The seaboard soft-coal trade remains quiet. Buying is still slow, both for harbor and coastwise trade, and deliveries on contract are not being urged. All-rail trade is also quiet.

Prices are rather ragged and do not improve. Gas coals bring $1@1.10 at mine for ¾-in., 95c.@$1 for run-of-mine, and 70c. for slack. Fair steam coals can be had for $1.15 at mine; prices ranging down to $1 for low quality and up to $1.35 at mine for the best.

Car supply is fair for what trade there is, and transportation is still rather slow. There is, however, coal enough at tide.

Coastwise rates are still high, and boats are scarce, owners being unwilling to take the risks of bad weather. From New York rates are 90c.@$1 to points around Cape Cod.

Henry B. Nedham has resigned his position as president of the Maryland Coal Company, after a long connection with the company in various positions. His resignation is due to ill health. William H. Ziegler has been chosen president.

Birmingham

Jan. 16—There is need for every ton of coal that can be mined in Alabama and the operations are being kept right up to the high notch. The coal is being handled promptly by the railroads; in but few instances is any complaint heard as to the car situation. There is a great quantity of coal being shipped from the State.

The demand for coke in Alabama is good also and the production is being kept up. In one or two places, efforts are being made to accumulate some coke for future use.

Chicago

Jan. 16—The coal market is far from being strong or in general satisfactory to wholesalers; receipts from western mines have been overabundant in the last week, and shipments are now being lessened, with the result that unless the weather becomes warm again we shall have a better condition of trade. Eastern coals in general are stronger than western, but shipments of them should be made cautiously, as the market threatens to relapse into one of its old-time spells of supplies of all kinds far in excess of demand, and consequent sales at cut prices to escape demurrage. Of Illinois and Indiana coals screenings are perhaps strongest. Domestic lump is weak and run-of-mine drags.

Illinois and Indiana bring, on cars, $1.90@2.75 for lump; $1.80@1.90 for run-of-mine and $1.50@1.90 for screenings. Smokeless, the firmest of eastern coals, brings $4.20 for lump and $3.30 for run-of-mine. Hicking holds to $3.15 and occasionally brings 15 or 25c. more, and is well restricted in shipments. Anthracite sales are fairly good, but not so heavy as the trade has hoped for, with chestnut more plentiful and moving freely.

Cleveland

Jan. 16—Local trade has quieted down and is rather easy. Supplies are good and there is little complaint of car shortage.

For Middle district coal, f.o.b. Cleveland, quotations are $2.15 for 1¼-in.,

$1.90 for ¾-in., $1.80 for run-of-mine, $1.50@1.60 for slack. No. 8 and Cambridge districts, 5 or 10c. higher. Pocahontas is in better supply than it has been, at $3.60 for lump and $2.60@2.75 for run-of-mine.

Indianapolis

Increasing cold weather has materially sharpened the demand for coal, but with few exceptions the railroads have been equal to the emergency. The car supply has been good, but there is some complaint because of delays in getting forward the loaded cars. Word comes from Chicago and other coal markets that the dealers have about exhausted their yard storage coal and are urging speedy delivery of their orders. The miners are working full time and in some fields there is a demand for more men. The demand for steam coal is not as great as it was previous to the holidays. Many factories are running slack and there are indications of less activity among the manufacturers—especially the automobile makers.

Prices of coal at the mines remain steady and will remain so unless there is a sudden fall in demand.

Pittsburg

Jan. 17—The transportation committee of the Chamber of Commerce, of Pittsburg, which gave a public hearing, Jan. 7, to representatives of the coal and coke interests, relative to the discrimination in ton-mile rates in favor of West Virginia and Kentucky fields to the Lakes, has had a private hearing with representatives of the railroads, and will have another within a few days, after which it will report to the Chamber of Commerce its findings in the premises, presumably with recommendations as to what should be done. The gossip is that the railroads will refuse to grant any portion of the relief asked, but nothing is really known as to their attitude, and the attitude of the committee is a matter of doubt.

There has been a flood in the rivers, all the coal in the harbor having gone out before the dangerous stage, and a good supply of empties is expected back on the fall. The local coal market is quiet, with prices moderately well maintained: Mine-run and nut, $1.15; ¾-in., $1.35; 1¼-in., $1.40; slack, 82½@85c. per ton at mine.

Connellsville Coke—The market has been quiet since the first of the year. Practically all the business involved in the furnaces now running has been done, and further activity depends upon furnaces now out of blast coming in. Prices are not quotably changed: Prompt furnace, $1.40@1.45; contract furnace, $1.50@1.60; prompt foundry, $2@2.10; contract foundry, $2.25@2.50, at ovens.

The *Courier* reports production in the week ended Jan. 7 at 281,885 tons, a gain of 42,000 tons over the previous, or holiday, week, but a loss of 1000 tons from the week preceding that; shipments at 2610 cars to Pittsburg, 4239 cars to points west and 689 cars to points east, a total of 7538 cars.

St. Louis

Jan. 16—The market has been very sluggish all week in sympathy with the weather, which has been very warm. Coal is harder to move at present than it has been in the last 18 months; in fact, it has not been as dull since the summer of 1909, and there is very little in sight that is encouraging.

The market on Carterville coal has weakened tremendously during the last ten days and prices have fallen off about 25c. per ton. Screenings have been in good demand and good prices have prevailed though a great many plants are shut down. If the industrial plants were all running full, screenings would be short.

Current prices in the St. Louis market are as follows:

	F.o.b. Mine.	F.o.b. St. Louis.
Standard:		
6-in. lump	1.30	1.82
2-in. lump	1.10	1.62
Mine-run	0.90	1.42
2-nut	0.80	1.32
2-in. screenings	0.50	1.02
Pea and slack	0.25	0.77
Staunton, Mt. Olive & Springfield:		
6-in. lump	1.75	2.27
3-in. lump	1.50	2.02
Mine-run	1.10	1.62
2-in. nut	0.80	1.32
2-in. screenings	0.60	1.12
Carterville:		
6-in. lump or egg	1.60	2.27
3-in. nut	1.40	2.07
Mine-run	1.20	1.87
1½-in. screenings	0.70	1.37
Franklin County:		
6-in. lump or egg	1.75	2.42
3-in. nut	1.40	2.07
2-in. nut	1.20	1.87
1½-in. screenings	0.70	1.37
Trenton:		
6-in. lump	2.25	2.77
6-in. egg	2.25	2.77
3-in. nut	2.00	2.52
Pennsylvania Anthracite:		
Chestnut	....	7.20
Stove and egg	....	6.95
Grate	....	6.70
Arkansas Anthracite:		
Egg or grate	....	6.25
Coke:		
Connellsville foundry	2.50	5.30
Gas house	....	5.00
Smithing coal	1.65	4.15
Pocahontas Smokeless:		
Lump and egg	2.15	2.65
Mine-run	1.25	3.75

Prices at East St. Louis are 20c. per ton below the St. Louis quotations.

Anthracite—The market has been the same and the demand for Pennsylvania anthracite and West Virginia smokeless has been quite strong for the past week.

FOREIGN·COAL·TRADE

Australian Coal Exports—The full returns of the Commonwealth, issued rather late, give exports of coal from Australian ports in 1909 at 1,680,986 long tons; coal bunkered, or furnished to steamships in foreign trade, 1,242,457 tons; total, 2,923,453 tons. The exports were 879,856 tons less than in 1908, the decrease being due to the miners' strike in New South Wales. The principal exports were to: Chile, 469,420; New Zealand, 240,346; Philippine Islands, 224,671; Straits Settlements, 150,380; United States, 106,777 tons.

Welsh Coal Exports—Exports of Welsh coal from the four shipping ports—Cardiff, Newport, Swansea and Port Talbot—in 1910 were 25,002,957 long tons, a decrease of 147,694 tons from 1909. Coal bunkered or supplied to steamers in 1910 was 4,095,331 tons, a decrease of 305,189 tons. Water shipments coastwise were 4,161,424 tons, an increase of 45,868 tons. Total shipments by water 33,269,706 tons, a decrease of 407,015 tons.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on Jan. 7 as follows: Best Welsh steam coal, $4.02; seconds, $3.84; thirds, $3.72; dry coals, $3.72; best Monmouthshire, $3.60; seconds, $3.42; best steam small coal, $2.28; seconds, $2.04. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, Jan. 18—The meetings in New York last week were barren of results. The situation was talked over, but no conclusions were reached. Apparently it was decided to let matters drift on as they are, and to maintain prices, if possible. This is about what was expected from the discussions which preceded the meeting.

More inquiries and more sales of pig iron are reported in Eastern territory, but orders are mainly of moderate size. Consumers are still ordering for only a short time ahead. Southern furnaces are rather pushing for business on a basis of $11 Birmingham, and are accepting a shade less to secure orders. Some eastern furnaces have been reducing wages, but the movement does not seem to spread.

The attitude of the steel trade is that inasmuch as last week's dinner disclosed a practically universal sentiment in favor of the maintenance of the present prices there will be no reductions, barring accidents. Occasional shading by small mills will not be seriously regarded, but should any of the important interests deviate at all from the recognized level the whole market would probably become wide open and prices would decline sharply. There is no intention of holding any more meetings, at least for some time, and this program is not likely to be changed unless some important developments occur. Reports continue to circulate that prices are being badly cut, but these re-

ports are incorrect, for there is evey reason for believing that the leading steel interests are holding prices absolutely, and that any individual interest detecting deviations would take such action as would lead within a day or two to general public recognition of the fact that the market had broken.

The present volume of business is very light, despite the improvement which has occurred, and probably does not represent on an average more than about 40 per cent. of the producing capacity, and is not much below the current rate of operations, which is certainly well under 50 per cent. in the steel industry as a whole. A point has been reached, however, at which the mills are no longer drawing upon old orders to make up current shipments.

Rolled Iron and Steel—The American Iron and Steel Association reports the total make of rolled iron and steel in all forms in the United States in 1909, at 19,644,690 long tons; an increase of 7,816,497 tons over 1908, but a decrease of 220,132 tons from 1907. The total make of forgings in 1909 was: Iron, 25,523; steel, 223,741; total, 249,264 tons. This was 118,121 tons more than in 1908, but 131,541 tons less than in 1907, the year of highest production.

Ferrosilicon Syndicate—An International Syndicate of producers of ferrosilicon was organized recently at a meeting held at Mannheim, Germany. It includes all the manufacturers in France, Germany and Austria. The new syndicate has made a contract with the Berner Kraftwerk Gesellschaft, of Berne, Switzerland, under which that company will cease to make ferrosilicon, receiving a money equivalent in return.

Baltimore

Jan. 16—Exports for the week included 246,600 lb. spelter, 2,822,200 lb. steel billets and 634,400 lb. iron pipe to Liverpool; 5840 tons steel rails to Rockhampton, Australia. Imports included 30 tons spiegeleisen and 2162 tons ferromanganese from Middlesboro, England; 164 tons ferromanganese from Rotterdam; 4000 tons manganese ore from India; 5700 tons iron ore from Cuba.

Birmingham

Jan. 16—Improvement is noted in the pig-iron market in Southern territory. Reports have it that one of the larger cast-iron pipe companies, has been in the market recently and the amount of iron said to have been purchased ranges between 12,000 and 45,000 tons. There have been a number of small sales made recently, indicating that consumers have worked off almost all of their accumulated stock. There is a lively inquiry for iron, for delivery during the first and second quarters of the year and a few inquiries have come to light for iron to be delivered during the last half of the year. No effort is being made to get business at present for delivery during the last half of the year. The quotations still hover around $11 per ton, No. 2 foundry.

The steel plant of the Tennessee company, which shut down for the holidays and for some little repairing on Dec. 23, has resumed operations. Reports have it that orders have been received recently for rail to the amount of more than 85,000 tons.

Charcoal iron has been selling recently in this territory, the aggregate of business in this line since the first of the year amounting to 3000 tons; 1500 tons of iron were sold by one firm during the past week, the prices ranging between $22 and $22.50 per ton.

Chicago

Jan. 16—Sales of pig iron are increasing and inquiries have become much more numerous following the determination of the Steel Corporation not to reduce prices for the present. This has had the effect of bringing into the market purchasers who have been holding off for signs of a decided change and it has stirred many who were buying in small quantities to increase their tonnage. The market is still chiefly for small lots and early delivery; a few purchases run into the third quarter and inquiries are chiefly for good sized lots on second- and third-quarter deliveries.

Nominally Southern No. 2 remains at $11 Birmingham, or $15.35 Chicago, though some sales probably are made under this figure. Northern No. 2 is quoted at $16, under similar conditions. Sales of iron and steel materials are increasing and in general the market has a much better tone.

Cleveland

Jan. 16—Nothing doing yet as to ore prices. The general belief is that last season's prices will be renewed.

Pig Iron—The market shows quite a number of inquiries, but only small business actually closed. Nominal prices, Cleveland delivery, are $15.90 for bessemer, $14.40 for basic, $14.25 for No. 2 foundry and $13.75@14 for forge.

Finished Material—Bids are in for several small contracts for structural steel. Bars are quiet, but there is some inquiry for plates. There has also been some business in sheets.

Philadelphia

Jan. 18—A general spirit of anticipation pervades the entire market. It is true that in the past three days there have been more inquiries but no makers in this territory are able to report many absolute orders for future delivery. The only exception is found among the pipe manufacturers who are continually buying iron in a small way. There is more activity in malleable iron than for several weeks, but the requirements are mostly trifling in quantity. Makers of forge complain of extreme dullness and users of No. 2 foundry have refused to make big orders on the most inviting terms. According to today's indications there will be two or three transactions in basic which is quoted at $15, but it is understood that less money will get it. Sales of gray forge were made today at $14.50 and No. 2 foundry is offered at $15.75, which, it is expected, will result in two or three sales for local and New England delivery.

Steel Billets—Inquiries are more encouraging but there is nothing to warrant the belief that large transactions will result.

Bars—Some further curtailment of bar output, as compared to December, is reported, and business is, if anything, at a lower ebb, particularly among jobbers. There is no observable lessening of consumption, but business has taken on a purely hand-to-mouth character.

Sheets—The only reason for a little improvement noted since the first of the year is that consumers of sheets ran out absolutely and had to buy. There is not the slightest sign of forward buying.

Pipes and Tubes—The tube market is dragging and no business is reported. Pipe is dull, excepting cast-iron pipe.

Plates—A slightly stronger tone has developed, not from orders placed but from inquiries submitted.

Structural Material—A half-dozen local requirements will probably take some 7000 tons of building material. Within a month other local demands will at least double these figures.

Scrap—The scrap market has lapsed into inactivity after a few sales last week and dealers are slow to fill their yards or contract for supplies.

Pittsburg

Jan. 17—There has been a distinct, although slight improvement in the volume of finished-steel business placed, and this increase is attributed chiefly to the fact that the much-discussed steel dinner of Jan. 11 is past. There had been a feeling of nervousness among buyers on account of the possibility of prices being reduced. Steel manufacturers claim that buyers as a class did not want prices to be reduced, and in holding back orders did so merely to take advantage of reductions should they be made.

Pig Iron—There has been a material improvement in pig-iron inquiry in the past week, and actual business placed has also been larger, but most of this business was by consumers who are in the habit of contracting at this time for the half-year. By far the most important tonnage mentioned in this connection is between 30,000 and 40,000 tons of forge taken by the United States Cast

Iron Pipe and Foundry Company for its Scottdale, Penn., plant, from an adjoining furnace, there being no freight involved and the price representing a division between buyer and seller of the freight expense thereby saved. The Standard Sanitary Manufacturing Company has inquired for 1000 to 2000 tons for first-half delivery to each of its plants, Louisville, New Brighton and Allegheny, Southern iron being involved for Louisville and Northern for the other two plants. It will probably buy considerably larger tonnages for each plant than inqunred for. The merchant furnaces have dropped into an apathetic condition, apparently caring little whether buyers take iron or not, as current prices are well below cost of production based upon purchased ore, and it does not seem probable that the furnaces which have their own ore supplies can take care even of the reduced demand. We continue to quote $15 for bessemer, $13.50 for basic and malleable and $13.75 to $14 for forge, at Valley furnaces, prices delivered Pittsburg being 90c. higher.

Ferromanganese—A steel interest is reported to have bought 700 tons for delivery over the year, at about $38, Baltimore, and we quote the market not over strong at this figure for prompt or first-half delivery.

Steel—The market continues quiet, so much tonnage on contract having been carried over from last year. Prices are well maintained by the large interests, but may possibly be shaded occasionally on odd lots by small producers. Regular prices are $23 for billets and $24 for sheet bars, bessemer or open-hearth, f.o.b. Pittsburg or Youngstown mills, with rods at $27.50, Pittsburg.

Sheets—Business is still light, but has shown a slight improvement. Prices are reported well maintained at 2.20c. for black, 3.20c. for galvanized, 1.65c. for blue annealed, 10 gage, $1.55 for painted corrugated and $2.75 for galvanized corrugated.

St. Louis

Jan. 16—The pig-iron market remains very dull and there is scarcely any change to be noted. All users are purchasing very gingerly as it seems to be the general impression that a still further reduction in iron is probable. The current price is $11 per ton Birmingham or $14.75 St. Louis for No. 2 foundry.

FOREIGN IRON TRADE

United States Foreign Trade

Iron and Steel—Exports and imports of the leading articles of iron and steel in the United States for the 11 months ended Nov. 30 were, in long tons:

	Exports 1909.	Exports 1910.	Imports 1909.	Imports 1910.
Pig iron	57,913	115,966	147,835	217,322
Scrap	24,957	21,109	41,424	70,143
Billets, blooms, etc.	101,237	47,350	14,400	44,784
Bars	79,317	116,253	16,523	35,716
Rails	246,389	311,587	....	.....
Sheets and plates	159,034	251,475	3,955	5,967
Structural steel	82,315	133,403	.....	.....
Wire-rods	17,781	21,297	9,953	18,924
Wire	136,358	158,030	.....	.....
Nails and spikes	43,562	55,680	.....	.....
Tinplates	8,197	11,402	57,398	63,530
Pipe and fittings	145,375	142,480	.....	.....

Imports of wire not reported in quantities; values were $994,220 in 1909 and $1,365,375 in 1910. Imports of rails and structural steel not reported this year.

The values of the exports and imports and the movement of iron ore were given last week.

Manganese Ore—Imports of manganese ore for the 11 months were 199,222 long tons in 1909, and 235,834 in 1910; increase, 36,612 tons.

METAL MARKETS

New York, Jan. 18—The metal markets have been interesting chiefly on account of the heavy movement in copper.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1910	$1,330,400	$ 4,976,632	Imp.$ 3,646,232
" 1909	10,579,304	2,083,772	Exp. 8,495,532
Year 1910	58,774,822	59,222,518	Imp. 447,696
" 1909	132,880,821	44,086,966	Exp. 88,793,855
Silver:			
Dec. 1910	6,059,348	4,397,410	Exp. 1,661,938
" 1909	5,297,965	4,203,696	" 1,094,269
Year 1910	57,359,261	45,877,128	" 11,482,133
" 1909	57,592,309	46,187,702	" 11,404,607

Exports from the port of New York, week ended Jan. 14: Gold, $95,160, chiefly to South America; silver, $1,384,301, nearly all to London. Imports: Gold, $165,749; silver, $115,182, principaly from Mexico and Central America.

Gold—There was a little more demand on the open market in London and a slight premium was paid for supplies. Quotations were 77s. 9⅛d. per oz. for bars, and 76s. 4½d. per oz. for American coin.

Platinum—The market is quiet and prices are about the same, dealers asking $39 per oz. for refined platinum and $41.50 for hard metal, 10 per cent. iridium. The last named metal is scarce and higher.

Silver—Under pressure of China sales the silver market has receded and closes weak today at 24¾d. in London. Futures command a small premium, but the course of the metal is very uncertain.

SILVER AND STERLING EXCHANGE

Jan.	12	13	14	16	17	18
New York	54½	54½	54⅛	53¾	53⅞	53⅝
London	25 3/16	25 3/16	25	24 13/16	24 7/8	24¾
Sterling Ex.	4.8560	4.8565	4.8590	4.8580	4.8575	4.8565

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East for the full year were:

	1909.	1910.	Changes.	
India	£6,673,600	£7,210,700	I.	£537,100
China	1,960,000	1,459,000	D.	501,000
Straits	114,600	.....	D.	114,600
Total	£8,748,200	£8,669,700	D.	£ 78,500

Stocks in India at the close of the year were reported much reduced.

Copper, Tin, Lead and Zinc

NEW YORK

Jan.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. New York, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
12	12⅜ @12¾	12.30 @12.35	39¾	4.45 @4.50	4.30 @4.32½	5.47½ @5.52½	5.32½ @5.37½
13	12⅜ @12¾	12.25 @12.30	40½	4.45 @4.50	4.30 @4.32½	5.47½ @5.52½	5.32½ @5.37½
14	12⅜ @12¾	12.25 @12.30	40½	4.45 @4.50	4.30 @4.32½	5.47½ @5.52½	5.32½ @5.37½
16	12⅜ @12¾	12.25 @12.30	41	4.45 @4.50	4.30 @4.32½	5.45 @5.50	5.30 @5.35
17	12⅜ @12¾	12.30 @12.35	41¾	4.45 @4.50	4.32½ @4.35	5 45 @5.50	5.30 @5.35
18	12⅜ @12¾	12.35 @12 40	41¾	4.45 @4.50	4.32½ @4.35	5.45 @5.50	5.30 @5.35

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

Jan.	Copper. Spot.	Copper. 3 Mos	Copper. Best Sel'td	Tin. Spot.	Tin. 3 Mos	Lead, Spanish.	Zinc, Ordinaries.
12	55½	56⅜	59⅛	181½	182⅜	13 1/16	24⅛
13	55⅜	56¼	59⅛	183¼	183¾	13 1/16	24⅛
14	.....	.....	.....	.....	.....	.....	.....
16	55 7/16	56 5/16	59¼	187	187½	13 1/16	24⅛
17	55 11/16	56 9/16	59¼	190	190⅝	13 1/16	24⅛
18	56 1/16	56⅞	59½	190⅝	190¾	13 1/16	24⅛

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23=5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

Copper—The week of Jan. 12 to 18 witnessed a decided change in the copper market. For some time back business has been stagnant, and even in the face of concessions made by one agency after another, the buyers, although poorly covered, remained apathetic in general. However, some took advantage of opportunities in the downward offerings. Sellers were feeling the pulse of the market to find the point at which consumers

would be interested in taking over round lots. This developed about Friday last, when European buyers became disposed to take hold, and their action was later followed by domestic manufacturers. Considerable orders were placed for shipment over the next three months, and some of the producers are now well booked. We estimate that the sales of the week have amounted in the aggregate to something between 40,000,000 and 50,000,000 lb. They have been chiefly of electrolytic copper, comparatively little having apparently been done in Lake, which, during the early part of the week was rather nominal; but right at the close some fairly large sales running up to 12¾c. were reported. On Tuesday the electrolytic people having disposed of large quantities became stiffer in their prices and the increase was well maintained at the close. The sales of the week were divided among the large agencies, and the major portion was for foreign delivery. At the close, Lake copper is quoted at 12⅝@12¾c., and electrolytic copper in cakes, wirebars and ingots at 12.35@12.40c. Casting copper is quoted nominally at 12⅛@12¼c. as the average for the week.

Through an error in proofreading, the price of casting copper was given in our last issue at 12½@12⅜c.; it should have been 12⅛@12⅜c. for the week.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is ¼c. lower, at 14c. base, carload lots at mill.

The London standard market has also displayed strength and under a larger volume of business prices advanced to £56 0s. 9d. for spot, and £56 17s. 6d. for three months.

Considerable discussion was excited by an article in the *Journal of Commerce*, of Jan. 18, arguing that the copper market is in a bad way, owing to the huge accumulation of stocks whereof the official statistics record only a part. Such statements appearing in any less reputable journal could be dismissed without attention. In the present case our esteemed contemporary is undoubtedly in error in its estimates of invisible supply, while as for the copper in process of refining and in transit the item is, of course, substantially constant accumulation that must be carried so long as the business of copper production continues, and should no more be added to the report of refined copper in stock than should some supplies of raw material further back in the process. The evidence of the statistics of the other metal industries in 1910 does not indicate that the actual consumption of copper in the United States in 1910 was any less than the deliveries. The internal evidence of the copper business, in fact, points the other way.

Copper exports from New York for the week were 7992 long tons. Our special correspondent gives the exports from Baltimore for the week at 1758 tons.

Visible stocks of copper in England and France—including 11,860 tons afloat from Chile and Australia—were 83,250 tons on Jan. 15; a decrease of 610 tons from the Jan. 1 report.

It is rumored that Adolph Lewisohn will assume the management of the United Metals Selling Company after the forthcoming retirement of U. H. Broughton.

Tin—With the exception of Jan. 12, when the market took one of its characteristic tumbles, prices continued in their violent advance. Speculation on the London Metal Exchange is rampant. The buying power of the bull syndicate seems to be unlimited, and as the statistical position of the metal is of great assistance to the former, no one dare predict when the turn in the market will come. Good-sized quantities were taken by American interests, who, however, did not show much anxiety to realize profits on their holdings and are hesitating in making sales. The London market closes firm at £190 12s. 6d. for spot and £190 15s. for three months. The New York market is quoted at about 41¾ cents.

Messrs. Robertson & Bense report the arrivals of Bolivian tin concentrates at Hamburg, Germany, in December at 674 metric tons.

Tin output of the Federated Malay States for the full year is reported at 48,743 long tons in 1909, and 43,317 in 1910; a decrease of 5426 tons.

Tin shipments from the Straits for the full year are reported at 58,445 long tons in 1909, and 54,579 in 1910; a decrease of 3866 tons.

Lead—The market is a trifle easier at 4.32½@4.35 St. Louis and 4.45@4.50c. New York.

In the London market, Spanish lead is unchanged at £13 1s. 3d. and English at £13 3s. 9d. per ton.

Spelter—The market is quiet and without special feature, and prices are a trifle lower. At the close St. Louis is quoted at 5.30@5.35c. and New York at 5 45@5.50 cents.

The London market is firmer, good ordinaries being quoted at £24 2s. 6d. and specials at £24 7s. 6d. per ton.

Base price of zinc sheets is $7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—The market remains dull, and metal has been offered at lower figures. The quotations must again be reduced, and we quote 20½@21½c. per lb. for No. 1 ingots, New York.

Antimony—Demand seems to be reviving; moreover there are reports of the formation of a syndicate abroad, which may result in an advance. There has been more buying than for some time past. Quotations are 8¼c. per lb. for Cookson's, 7¾c. for U. S. and 7¼c. for outside brands.

Quicksilver—The market is steady, with prices unchanged. The New York quotations are $42 per flask of 75 lb. for large lots; $44@45 for jobbing orders. San Francisco, $41.50 for domestic business and $2 less for export. London price is £8 per flask, £7 12s. 6d. being quoted by second hands.

Cadmium—Current quotations are 60@70c. per lb. in 100-lb. lots, f.o.b. New York, according to quantity of metal.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Platteville, Wis., Jan. 14—The highest price paid this week for zinc ore was $44; the base price, 60 per cent. zinc, was $42.50@43.50. The base price paid for 80 per cent. lead ore was $54 per ton.

SHIPMENTS, WEEK ENDED JAN. 14.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	722,640	.....	.....
Platteville	672,200	.....	321,000
Galena	483,700	55,000	.....
Cuba City	167,440	.....	420,260
Highland	102,400	.....	.....
Benton	84,400	.....	.....
Harker	78,760	.....	.....
Linden	.....	.....	50,510
Total	2,311,140	55,000	791,770
Year to date	4,504,530	317,560	1,942,700

Shipped during week to separating plants, 2,540,520 lb. zinc ore.

Joplin, Mo., Jan. 14—The high price paid for zinc sulphide ore was $47 per ton, the assay base $40@44 per ton of 60 per cent. zinc. Zinc silicate ore sold at $22@25 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $40.72. The highest price for lead ore was $58, at which price most of the best ore was purchased, with the price shading down to $54 for medium grades. The average price, all grades, was $55.90 per ton.

Eight mining companies this week signed contracts with two smelting companies to sell their output of ore, approximately 800 tons, on a scale fixed by the Miners' Association. The scale is based on spelter at $5 per 100 lb., St. Louis quotation, with a price of $37 per ton of 60 per cent. zinc, no penalty for 2 per cent. iron, penalized $1 per ton the following three units, and 50c. per ton above 5 per cent. iron contents; a premium of $1 per ton if under 0.5 per cent. lead is shown. The increment above $5 spelter is $8.50 per ton of ore for each $1 advance in spelter. This is based on ore for Prime Western spelter. A higher

scale is proposed to be made for ore suitable for brass manufacture.

SHIPMENTS, WEEK ENDED JAN. 14.

	Zinc lb.	Lead lb.	Value.
Webb City-Carterville	3,478,550	720,670	$91,488
Joplin	1,456,580	49,820	32,676
Alba-Neck	1,335,460	.....	30,715
Galena	494,610	108,640	13,072
Spurgeon	668,170	34,060	11,775
Duenweg	454,520	67,200	10,823
Granby	241,460	15,990	3,880
Oronogo	57,600	85,000	3,488
Jackson	103,880	17,710	2,666
Carthage	92,520	.....	1,866
Stott City	85,560	.....	1,796
Sarcoxie	114,090	.....	1,788
Carl Junction	50,670	.....	1,140
Aurora	63,100	.....	694
Badger	30,500	.....	610
Totals	8,727,270	1,099,090	$208,477
2 weeks	15,365,750	2,042,080	$373,162
Zinc value, the week, $177,753;		2 weeks,	$316,178
Lead value, the week, 30,724;		2 weeks,	56,984

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.00	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	40.20	40.35	37.83	57.52	48.80
July	43.06	39.63	41.11	36.80	53.74	48.59
August	48.25	40.13	44.54	37.32	57.60	49.75
September	47.70	43.45	44.87	39.96	56.11	54.73
October	49.50	43.31	45.75	40.50	55.02	53.18
November	51.31	47.20	48.29	43.20	53.94	54.80
December	49.45	42.50	47.57	40.70	55.26	55.70
Year	$43.98	$42.43	$41.20	$39.79	$54.60	$52.12

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Other Ore Markets

Iron Ore—The Lake Superior season is closed and all buying of ore will now be done on next year's prices. No action has yet been taken toward fixing them.

In the East there is no organization of sellers, and no general quotations can be given. It may be said, however, that prices on the open market will range from 7 to 8c. per unit of iron delivered to furnace; which would be $3.50@4 for a 50 per cent. ore. Most ores, however, are sold under yearly contracts.

Manganese Ore—The base price, as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent. or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess of phosphorus and silica.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less.

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price is for the zinc content, less 8 units, at the St. Louis price of spelter; with a deduction of $14@15 per 2000 lb. of ore. See also Joplin and Wisconsin ore markets.

Pyrites—Domestic pyrites are quoted at 11½@12c. per unit of sulphur at mines for furnace sizes. Spanish pyrites, furnace sizes, are 12@12½c. per unit, ex-ship. Arsenical pyrites are from ½@1¼c. per unit less.

CHEMICALS

New York, Jan. 18—The general market is quiet, in sympathy with other markets, and new business has been rather scarce.

Copper Sulphate—Business has been rather slow. Prices are unchanged, at $4 per 100 lb. for carload lots and $4.25 per 100 lb. for smaller orders.

Arsenic—The market has been dull, with only light sales. Quotations are about $2.12½ per 100 lb. for white arsenic.

Nitrate of Soda—Business in this article is improving, and sales are beginning to be more active, as is usual at this season. Quotations are 2.10c. per lb., for both spot and future positions.

Messrs. W. Montgomery & Co., London, estimate the production and shipments of nitrate of soda for three years past as follows, in long tons:

	1908.	1909.	1910.
Shipments	2,017,000	2,100,000	2,285,000
Consumption:			
European Continent	1,275,000	1,354,000	1,531,000
Great Britain	103,000	111,000	120,000
United States	309,000	407,000	510,000
Other countries	45,000	66,000	89,000
Total	1,732,000	1,938,000	2,250,000

European stocks on Jan. 1 are estimated at 310,000 tons; quantities afloat at 659,000 tons.

MINING·STOCKS

New York, Jan. 18—The general stock markets have been rather dull, showing only small fluctuations on a business mainly professional. Anticipations of a rising market and of more public interest have not been realized. Steel common was rather strong, with fair sales at 75@76. Goldfield Consolidated, which is now dealt in on the Exchange, sold at 6¼@6⅝, closing at the highest.

The Curb trading was rather heavy, but with only small changes in quotations. Cobalt Central, Kerr Lake and La Rose were most active among the Cobalts. The copper stocks were generally quiet, with some small declines. Ray Central was the most active and advanced a little.

Boston, Jan. 17—The proposed Calumet & Hecla merger is about the only topic of conversation heard in this market. Stock trading is at a low ebb and while prices went off a trifle during the week, they came back easily.

Opposition to the terms offered the various companies in the Calumet & Hecla consolidation is gradually softening. This is due to contact with the management of this company. Several informal meetings of brokers and clients have been held to talk over the terms and today a regularly called meeting was

COPPER PRODUCTION REPORTS.
Copper contents of blister copper, in pounds.

Company.	October.	November.	December.
Anaconda	22,100,000	21,900,000	21,500,000
Arizona, Ltd.	3,004,000	3,010,000	3,224,000
Balaklala	928,360	.....	.....
Copper Queen	7,060,796	7,372,776	.....
Calumet & Ariz.	1,990,000	1,930,000	.....
Detroit	1,757,836	1,840,939	.....
East Butte	948,369	618,191	.....
Imperial	*nil*	*nil*	.....
Mammoth	.....	.....	.....
Nevada Con.	4,980,300	5,200,000	.....
Old Dominion	2,345,000	2,754,000	2,287,000
Shannon	1,286,000	1,420,000	.....
Superior & Pitts.	2,095,000	2,160,000	.....
United Verde*	.....	3,000,000	.....
Utah Copper Co.	7,582 212	7,468,515	.....
Lake Superior*	18,500,000	20,400,000	20,000,000
Non-rep. mines*	16,250,000	13,200,000	13,100,000
Total production	90,827,873	92,274,422	.....
Imports, bars, etc.	24,292,368	24,835,954	.....
Total blister	115,120,241	117,110,376	.....
Imp. in ore & matte	5,173,277	5,542,279	.....
Total	120,293,518	122,652,655	.....
Brit. Col. Cos.:			
British Col. Copper	702,154	917,994	.....
Granby	1,184,234	1,410,261	.....
Mexican Cos.:			
Boleo	2,278,454	.....	.....
Cananea	3,576,000	5 658,000	.....
Moctezuma	1,791,108	1,654,235	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
Year, 1909	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	120,067,467	62,844,818	40,585,767
IV	117,477,639	67,985,951	31 332,434
V	123,242,476	59,305,222	45,495,400
VI	127,219,188	53,363,196	65,895,948
VII	118,370,003	56,708,175	59,407,167
VIII	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424 316
XII	123,339,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494

	Visible Stocks. United States.	Europe.	Total.
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	123,824,874	249,625,600	373,450,474
V	141,984,159	246,870,400	388.854,559
VI	160,425,973	239,142,400	399,568,373
VII	168,386,017	232,892,800	401,278,818
VIII	170,640,678	222,320,000	392,960,677
IX	168,881.245	218,444,800	387,326.045
X	148,793,714	211,276,800	360,070,514
XI	139,261,914	198,060,800	337,322,714
XII	130,389,069	193,200,000	323,589,069
I, 1911	122,030,195	187,797,120	309,827,315

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

held by Stock Exchange brokers. It was a love feast, to be brief. The management was wise in giving three months before taking action on the matter. This allows the whole thing to be threshed out and as matters look now the plan will go through like clockwork. The possible exception will be Isle Royale. Osceola stockholders have made some talk of organizing against the merger, but as yet nothing definite has resulted. The new stock, as and when issued has risen from $210 bid to $223 bid.

Market movements are more or less dependent upon the action of Amalgamated and any weakness in that specialty is quickly reflected in the price of the local copper-share list, while strength of that issue brings response on the upside.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con., Nev.	Jan. 12	Feb. 12	$0.05
Alta, Nev.	Jan. 16	Feb. 6	0.03
Andes, Nev.	Jan. 19	Feb. 9	0.05
Big Elk, Ida.	Jan. 2	Feb. 2	0.002
Black Bear Con., Ida.	Jan. 12	Feb. 11	0.01
Bullion, Nev.	Jan. 9	Feb. 7	0.05
Con. Imperial, Nev.	Jan. 5	Jan. 30	0.01
Con. Virginia, Nev.	Feb. 7	Feb. 28	0.25
Copper Crown, Ida.	Dec. 26	Feb. 1	0.002
Crown Point, Nev.	Jan. 30	Feb 5	0.10
Dalmatia, Ida.	Jan. 23	Feb. 21	0.001½
Eureka M. & M, Ida.	Jan. 16	Feb. 16	0 002
Exchequer, Nev.	Jan. 24	Feb 14	0.05
Florence M. & M., Ida.	Feb. 20	Mar. 20	0.001
Gold Mt. Champion, Utah.	Jan. 10	Jan. 25	0.00½
Idaho-Nevada Expl., Ida.	Jan. 23	Feb. 23	0 000½
Keystone, Utah.	Dec. 15	Feb. 16	0.03
King Philip Copper, Mich.	.....	Feb. 11	1.00
Mexican, Nev.	Jan. 10	Jan. 31	0.20
Middle Swansea, Utah.	Jan. 21	Feb. 7	0.001
Reindeer Cop. & Gold, Ida.	Feb. 1	Feb. 25	0.005
Pac. Gold & Copper, Utah.	Jan. 12	Feb. 15	0.00½
Selma, Utah.	Feb. 15	Mar. 15	0.00½
Sierra Nevada, Nev.	Jan. 17	Feb. 8	0.10
Snowstorm Ext. Copper, Ida.	Jan 7	Feb. 6	0.003
Teddy M. & M., Ida.	Jan. 20	Feb. 20	0.002
Utah, Nev.	Jan. 10	Jan. 31	0.05

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	53.462	24.166	24.651
July	51.043	54.150	23.519	25.034
August	51.125	52.912	23.588	24.428
September	51.440	53.295	23.743	24.567
October	50.923	55.490	23.502	25.596
November	50.703	55.635	23.351	25.680
December	52.226	54.428	24.030	25.160
Total	51.502	53.486	23.706	24.670

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56¼	12.733	12.93¾	13.091	57.363	57.238
May	12.893	12.550	13.238	12.885	59.338	56.313
June	13.214	12.404	13.548	12.798	59.627	55.310
July	12.880	12.215	13.363	12.570	58.556	54.194
August	13.007	12.490	13.296	12.715	59.393	55.733
September	12.870	12.379	13.210	12 668	59.021	55.207
October	12.700	12.553	13.030	12.788	57.551	56.722
November	13.125	12.742	13.354	12.914	58.917	57.634
December	13.298	12.581	13.647	12.863	59.906	56.069
Year	12.982	12.738	13.335	13.039	58.732	57.054

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	32.695
February	28.290	32.920	August	29.966	33.972
March	28.727	32.403	September	30.293	34.982
April	29.445	32.976	October	30.475	36.190
May	29.225	33.125	November	30.859	36.547
June	29.322	32.769	December	32.913	38.199
			Av. Year	29.725	34.123

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	4.343	4.291	4.207	13.031	12.688
July	4.321	4.404	4.188	4.291	12.563	12.531
August	4.363	4.400	4.227	4.290	12.475	12.513
September	4.342	4.400	4.215	4.289	12.781	12.582
October	4.341	4.400	4.215	4.271	13.175	13.091
November	4.370	4.442	4.252	4.314	13.047	13.217
December	4.560	4.500	4.459	4.363	13.125	13.197
Year	4.273	4.446	4.153	4.312	13.049	12.920

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	5.128	5.252	4.978	22.000	22.094
July	5.402	5.152	5.252	5.002	21.969	22.406
August	5.729	5.279	5.579	5.129	22.125	22.800
September	5.796	5.514	5.646	5.364	22.906	23.165
October	6.199	5.628	6.043	5.478	23.200	23.900
November	6.381	5.976	6.231	5.826	23.188	24.083
December	6.249	5.624	6.099	5.474	23.094	24.019
Year	5.503	5.520	5.352	5.370	22.201	23.050

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.10	15.02	15.94	15.08	16.18
June	16.13	16.52	15.84	15.60	15.63	15.53
July	16.40	16.40	15.90	15.40	15.96	15.40
August	17.16	16.09	16.17	14.89	16.20	15.16
September	18.44	15.92	16.80	14.73	17.03	14.93
October	19.75	15.90	17.84	14.05	18.02	14.88
November	19.90	15.84	18.37	14.26	18.09	14.78
December	19.90	15.90	18.15	14.15	17.90	14.65
Year	$17.46	$17.10	$16.46	$15.65	$16.40	$15.83

STOCK QUOTATIONS

COLO. SPRINGS Jan. 17

Name of Comp.	Bid.
Acacia	.04⅜
Cripple Cr'k Con.	.02½
C. K. & N.	.15
Doctor Jack Pot.	.08½
Elkton Con.	.74½
El Paso	.84
Fannie Rawlins.	‡.05
Findlay	‡.06
Gold Dollar	.12⅝
Gold Sovereign	.02½
Isabella	.18
Jennie Semple	.10⅜
Lexington	.01⅜
Moon Anchor	.03½
Old Gold	.09½
Mary McKinney.	.47½
Pharmacist	.02½
Portland	1.03
Vindicator	.90
Work	.03½

SALT LAKE Jan. 17

Name of Comp.	Bid.
Beck Tunnel	.13
Bingham Copper	‡.15
Carisa	.14
Colorado Mining	.33
Columbus Con.	.10
Daly Judge	4.45
Grand Central	.70
Iron Blossom	.89
Little Bell	.70
Lower Mammoth	.08
Mason Valley	9.25
Maj. Mines	‡.53
May Day	.09½
Nevada Hills	2.40
New York	‡.13
Prince Con	.67
Silver King Coal'n	2.00
Sioux Con.	.31
Uncle Sam	.45½
Victoria	‡1.07½

SAN FRANCISCO. Jan. 17.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.05
Belcher	.70
Best & Belcher	.19
Caledonia	.26
Challenge Con.	.08
Chollar	.11
Confidence	.38
Con. Cal. & Va.	.60
Crown Point	.44
Gould & Curry	.11
Hale & Norcross	.11
Mexican	.64
Occidental	.41
Ophir	1.00
Overman	.41
Potosi	‡.30
Savage	.08
Sierra Nevada	.16
Union Con.	.21
Yellow Jacket	.34

Name of Comp.	Bid.
MISC. NEV. & CAL.	
Belmont	5.82½
Jim Butler	.25
MacNamara	.18
Midway	.16
Mont.-Tonopah	.89
North Star	.04
West End Con.	.56
Atlanta	.13
Booth	.11
C.O.D. Con.	.06
Comb. Frac.	.16
Jumbo Extension	.25
Oro	.05
Silver Pick	.05
St. Ives	.16
Tramps Con.	.02
Argonaut	1.30
Bunker Hill	‡7.25
Cent. Eureka	1.10
So. Eureka	6.50

N. Y. EXCH. Jan. 17

Name of Comp.	Clg.
Amalgamated	65
Am. Agri. Chem.	47½
Am.Sm.&Ref.,com	77⅛
Am. Sm. & Ref., pf.	104¾
Anaconda	39¾
Batopilas Min.	2
BethlehemSteel pf	60½
Federal M. & S., pf.	48⅛
Goldfield Con.	6⅜
Great Nor., ore ctf.	58
Homestake	‡85½
Nat'nalLead,com.	55½
National Lead, pf.	108½
Nev. Consol.	18⅞
Pittsburg Coal, pf.	66½
RepublicI&S,com.	32⅞
Republic I & S, pf.	94½
SlossSheffi'd,com.	51½
Sloss Sheffield, pf.	112½
Tennessee Copper	34¼
Utah Copper	46
U. S. Steel, com.	78¼
U. S. Steel, pf.	118⅞
Va. Car. Chem.	64⅞

N. Y. CURB Jan. 17

Name of Comp.	Clg.
Ariz.-Cananea	3½
Barnes King	‡1/16
Braden Copper	4¾
B. C. Copper	6⅝
Buffalo Mines	‡2½
Butte Coalition	18⅛
Caledonia	‡1⅛
Calumet & Mont.	‡.90
Chino	21⅝
Cobalt Central	.10
Con. Ariz. Sm.	1⅛
Davis-Daly	1 7/16
Ely Con.	.31
El Rayo	2⅛
Florence	1½
Giroux	6½
Greene Cananea	6½
Greenwater	.05
Guanajuato	3 1/16
Guerrero	‡1⅛
Guggen. Exp.	‡197½
Inspiration	8⅛
Internat. S. & R.	131
Kerr Lake	6⅛
La Rose	4 1/16
McKinley-Dar-Sa.	1 1/16
Miami Copper	19⅞
Mines Co. of Am.	5¼
Mont. Shoshone	‡.13
Nev. Utah M. & S.	⅛
Nipissing Mines	10⅞
Ohio Copper	1⅛
Pacific Sm. & M.	⅛
Precious Metals	1⅛
Ray Central	2
Ray Con.	17¾
Red Warrior	1⅛
South Utah M. & S.	⅞
Standard Oil	630¼
Stewart	¾
Tonopah	8¼
Tonopah Ex.	.96
Tri-Bullion	⅝
Tularosa	⅛
Union Mines	1 1/16
Yukon Gold	3⅞

LONDON Jan. 18

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 2 3
Camp Bird	1 15 10½
Esperanza	1 15 6
Tomboy	0 15 0
El Oro	1 7 9
Oroville	0 7 6
Mexico Mines	7 16 3

BOSTON EXCH. Jan. 17

Name of Comp.	Clg.
Adventure	6¾
Algomah	7½
Allouez	35
Am. Zinc	25⅛
Arcadian	3¼
Arizona Com.	14⅝
Atlantic	4⅛
Bonanza	.52½
Boston & Corbin	12⅛
Butte & Balak	6½
Calumet & Ariz.	46¾
Calumet & Hecla	517
Centennial	12⅛
Con. Mercur	.05
Copper Range	68
Daly-West	3½
East Butte	12¾
Franklin	8½
Granby	36
Hancock	21½
Helvetia	1⅛
Indiana	12½
Isle Royale	14¾
Keweenaw	3
Lake	35
La Salle	4⅝
Mass	7⅛
Michigan	3
Mohawk	44½
Nevada	18⅞
North Butte	28
North Lake	6¾
Ojibway	5⅝
Old Dominion	40½
Osceola	110
Parrot	11¾
Quincy	70
Shannon	11¾
Shattuck-Ariz.	22
Superior	38¾
Superior & Bost.	5
Superior & Pitts.	14
Tamarack	45½
Trinity	4¾
U. S. Mining	36
U. S. Mining, pf.	47
Utah Apex	2¾
Utah Con.	12¾
Victoria	2
Winona	8¾
Wolverine	112
Wyandot	1½

BOSTON CURB Jan. 17

Name of Comp.	Last.
Ahmeek	‡183
Bingham Mines	‡2½
Boston Ely	.89
Boswyocolo	.07⅛
Cactus	.21
Calaveras	2.37½
Champion	.03
Chemung	‡.08½
Chief Cons	1.37½
Cons. Ariz.	1⅛
Corbin	4.37½
Crown Reserve	2.50
First Nat. Cop.	1.93¾
Live Oak	23¾
Mackinaw	.26
Majestic	.37
Nat'l Mine & Ex.	.02
Nevada-Douglas.	‡2⅛
Oneco	2.00
Raven Copper	.45
Rhode Island Coal	5.12½
San Antonio	1/16
South Lake	6.75
Superior & Globe	‡.13
Trethewey	1 1/16
Tuolumne Copper	4⅛
Vulture	.07⅛
Yuma	.30

‡Last quotation.